APPENDICES

This page intentionally left blank

APPENDIX A

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

This page intentionally left blank

Table of Contents

Page

This page intentionally left blank

Appendix A-1

Interagency and Intergovernmental Coordination for Environmental Planning – Description of Proposed Action and Alternatives

This page intentionally left blank

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Mr. Mark Wolfe
Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711

Dear Mr. Wolfe

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

Pursuant to 36 CFR Sections 800.4(a) and (b), we request your assistance defining the Area of Potential Effects and information on any historic properties located therein that may be affected by our undertaking. A summary of the Description of Proposed Action and Alternatives (DOPAA) and location maps are attached for your review. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

To ensure the U.S. Air Force has sufficient time to consider your input in the preparation of the Draft EA, and for compliance with Section 106 of the National Historic Preservation Act,

please provide written questions or comments at your earliest convenience but no later than 35 days from the date of this correspondence. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2018.09.19 18:34:13 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Mr. Adam Zerrenner
Field Supervisor
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, TX 78758

Dear Mr. Zerrenner

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Further, pursuant to Section 7 of the Endangered Species Act, we request additional information on what listed, proposed, and candidate species or designated or proposed critical habitats may be in the action area. This information and your comments on the Proposed Action will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide additional information and your written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2018.09.19 18:35:01 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. William Nelson, Sr.
Chairman, Comanche Nation, Oklahoma
HC-32, Box 1720
584 NW Bingo Road, Highway 281
Lawton, OK 73520

Dear Chairman William Nelson, Sr.

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Comanche Nation, Oklahoma may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their

disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2018.09.19 18:50:31 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. Arthur "Butch" Blazer
President, Mescalero Apache Tribe of the Mescalero Reservation
P.O. Box 227
Mescalero, NM 88340

Dear President Blazer

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Mescalero Apache Tribe of the Mescalero Reservation may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:51:29 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. Russell Martin
President, Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653-4499

Dear President Russell Martin

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Tonkawa Tribe of Indians of Oklahoma may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:49:37 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Ms. Terri Parton
President, Wichita and Affiliated Tribes
P.O. Box 729
Andarko, OK 73005

Dear President Terri Parton

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Wichita and Affiliated Tribes may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:48:06 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Diane Bartlett
Bexar County Public Works
233 North Pecos Street, Suite 420
San Antonio, TX 78207

Dear Ms. Bartlett

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:23:18 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Stephen Brooks, Chief
Regulatory Branch
U. S. Army Corps of Engineers, Fort Worth District
819 Taylor Street
Fort Worth, TX 76102

Dear Mr. Brooks

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:23:59 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

John E. Cantu, Environmental Manager
Municipal Plaza Building
114 W. Commerce, 2nd Floor
P.O. Box 839966
San Antonio, TX 78283-3966

Dear Mr. Cantu

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2018.09.19 18:24:36 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Tiffany Harris
Public Relations Coordinator
Alamo Area Council of Governments
8700 Tesoro Drive #700
San Antonio, TX 78217

Dear Ms. Harris

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2018.09.19 18:25:13 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Russell Hooten, Habitat Assessment Biologist
Wildlife Division, Wildlife Habitat Assessment Program
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744-3291

Dear Mr. Hooten

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:26:17 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Richard A. Hyde, PE
Executive Director
TCEQ
Mail Code 122, P.O. Box 13087
Austin, TX 78711-3087

Dear Mr. Hyde

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:27:07 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Anne L. Idsal, Administrator
USEPA Region 6
1445 Ross Avenue, Suite 1200
Mail Code: 6RA
Dallas, TX 75202-2733

Dear Ms. Idsal

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:28:58 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Patrice Melancon, PE, CFM
Watershed Engineering Manager
San Antonio River Authority
100 East Guenther Street
San Antonio, TX 78204

Dear Ms. Melancon

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2018.09.19 18:29:45 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

NEPA Coordinator
TCEQ
P.O. Box 13087
Austin, TX 78711-3087

Dear Sir/Madam

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2018.09.19 18:30:23 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Ross Richardson
Branch Chief
Federal Emergency Management Agency
FRC 800 North Loop 288
Denton, TX 76209-3698

Dear Mr. Richardson

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:32:44 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Michael Segner, CFM
NFIP State Coordinator
Texas Water Development Board
1700 North Congress Avenue
Austin, TX 78701

Dear Mr. Segner

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:33:21 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

Attachment 1: DOPAA Summary

To accomplish the United States Air Force's (Air Force) mission, it is critical that combat pilots, and the Airmen supporting them, adequately train to attain proficiency on tasks they must execute during times of war and further to sustain this proficiency as they serve in the Air Force. Increasingly, fighter pilots of the Combat Air Force (CAF) have been operating at degraded levels of proficiency and training readiness due to diminishing fiscal resources. Along with insufficient budgets to support the flying hours/training requirements needed by CAF pilots, they have also been supporting adversary air (ADAIR) flying missions, which have minimal training value to the CAF pilots themselves. ADAIR sorties simulate an opposing force that provide a necessary and realistic combat environment during CAF training missions. Flying these ADAIR sorties requires the use of potential adversaries' tactics and procedures that may differ significantly from CAF tactics and procedures; therefore, ADAIR sorties provide minimal CAF training while taking up valuable flying hours that could otherwise be spent on core training tasks. Contract ADAIR would provide the Air Force another way to fill ADAIR sorties, improve the quality of training and readiness of CAF pilots, and allow the Air Force to recapitalize other valuable assets and training time.

The Air Force is proposing to provide dedicated contract ADAIR sorties for CAF training at Joint Base San Antonio – Lackland, Kelly Field Annex (**Figure 1**), to address shortfalls in F-16 pilot training and production capability. The Proposed Action at Kelly Field Annex would include the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven contractor aircraft to fly an estimated 1,200 annual sorties in support of the 149th Fighter Wing at Kelly Field Annex. This number of contract ADAIR sorties also includes sorties expected for aircraft leaving for or returning from either maintenance or other deployments. Contract ADAIR would fly up to a projected 5 percent of the estimated 1,200 sorties during environmental night hours when the effects of aircraft noise are accentuated (10:00 pm to 7:00 am local time).

Kelly Field Annex has existing facilities to support the Proposed Action. The proposed facilities are available for use and require minimal modification. They are located around the existing airfield and runway and include the necessary ramp space; maintenance space; operational space; petroleum, oil, and lubricants storage; runway access; and associated parking to support the contract ADAIR mission. Kelly Field Annex has three options for providing proposed operations facilities which include operations and aircraft maintenance functions (**Figures 2** and **3**). Under Option 1, both Operations and Maintenance office and hangar space would be consolidated in Hangar 1612 with aircrew briefings in Building 917. Option 2 is similar to Option 1, but Operations and Maintenance would instead be consolidated in Hangar 1610 with aircrew briefings occurring in Building 917. Under Option 3, Operations would be integrated with the 182d Fighter Squadron in Building 917, and maintenance space would be located in Hangar 1610. Under all three options, aircraft would be parked on the East Ramp near Hangars 1610 and 1612. Hangars 1610 and 1612 are owned by Port San Antonio and leased by the Air Force.

CAF training activities utilize special use airspace proximate to Kelly Field Annex. Special use airspace includes Military Operations Areas (MOAs), which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. The primary operational airspace that would be used by contract ADAIR aircraft includes the Crystal and Laughlin MOAs located approximately 75 miles southwest of Kelly Field Annex (**Figure 4**). Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field Annex and the Brady MOAs located approximately 110 miles north-northwest of Kelly Field Annex. Kelly Field Annex and the surrounding MOAs provide a critical venue to train F-16 pilots. No airspace modifications would be required for contract ADAIR as part of the Proposed Action.

Contract ADAIR aircraft would employ chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during 100 percent of their training sortie operations on the Crystal and Crystal North MOAs; Laughlin 2, Laughlin 3 Low, and Laughlin 3 High MOAs; and Kingsville 3 MOA. Chaff and flares would not be used in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions. Chaff and flares are the principal defensive countermeasure dispensed by military aircraft to avoid detection or attack by enemy air defense systems.

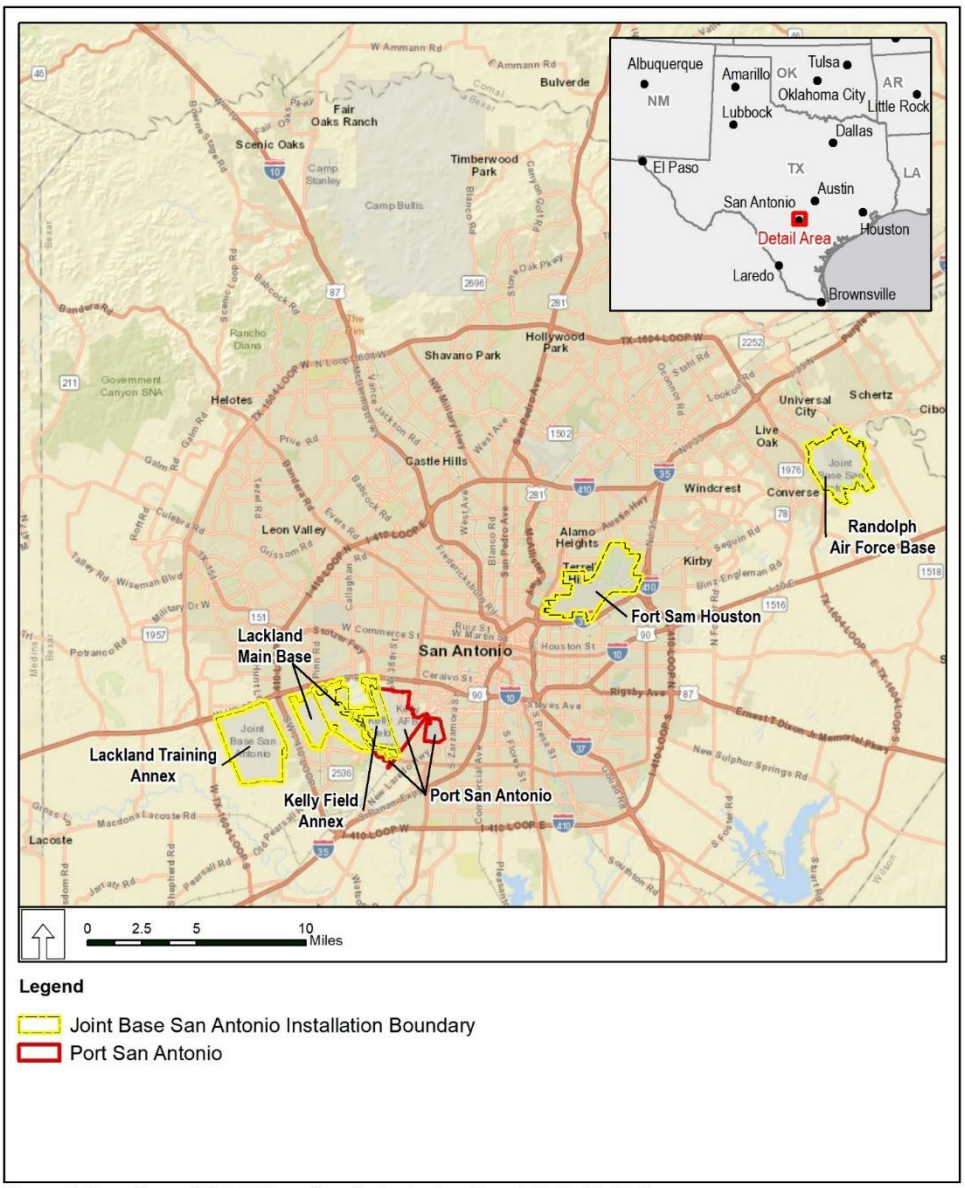


Figure 1. Location of Joint Base San Antonio-Lackland, Kelly Field Annex.

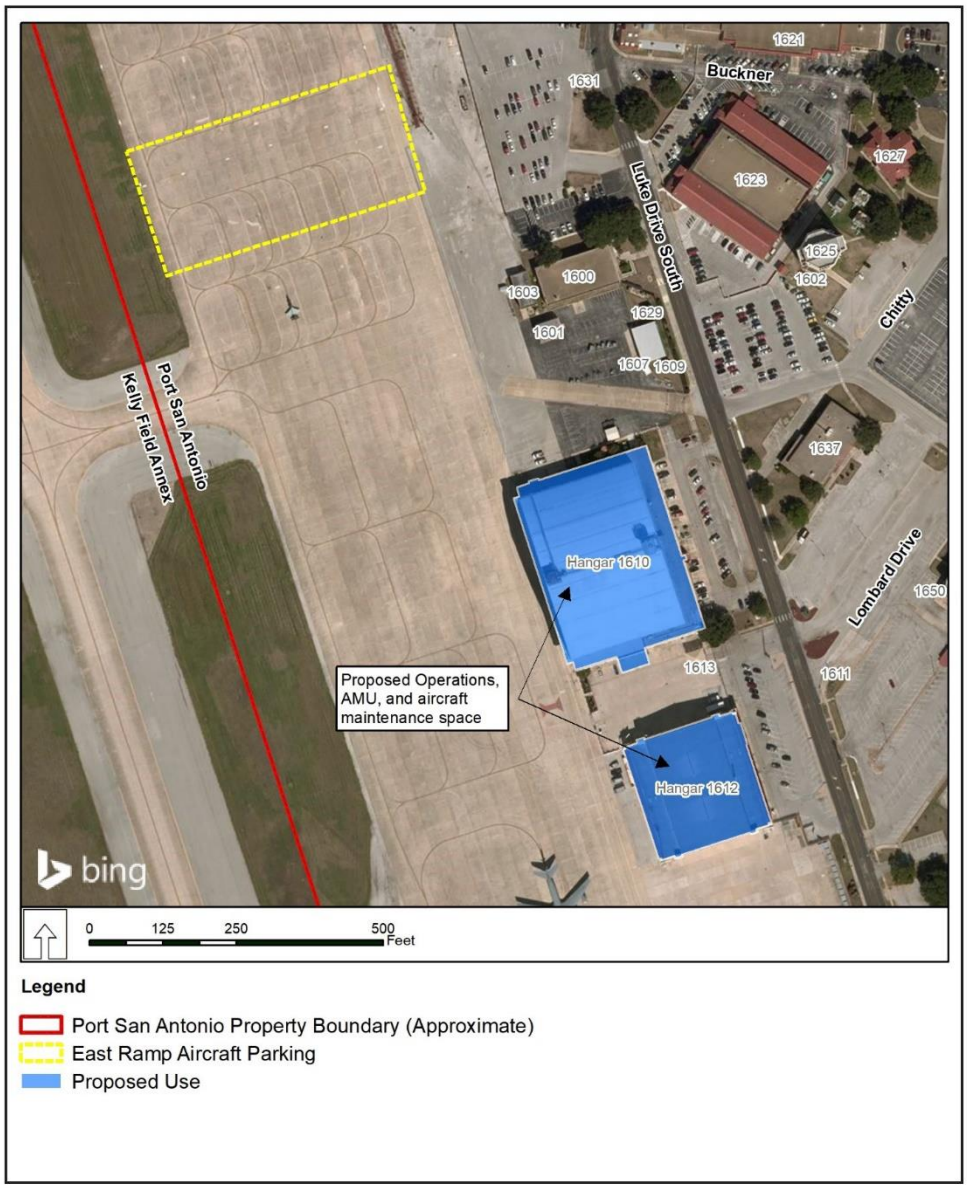


Figure 2. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space at Hangars 1612 and 1610 and Aircraft Parking on the East Ramp.

Figure 3. Proposed Location for Operations Space at Building 917.

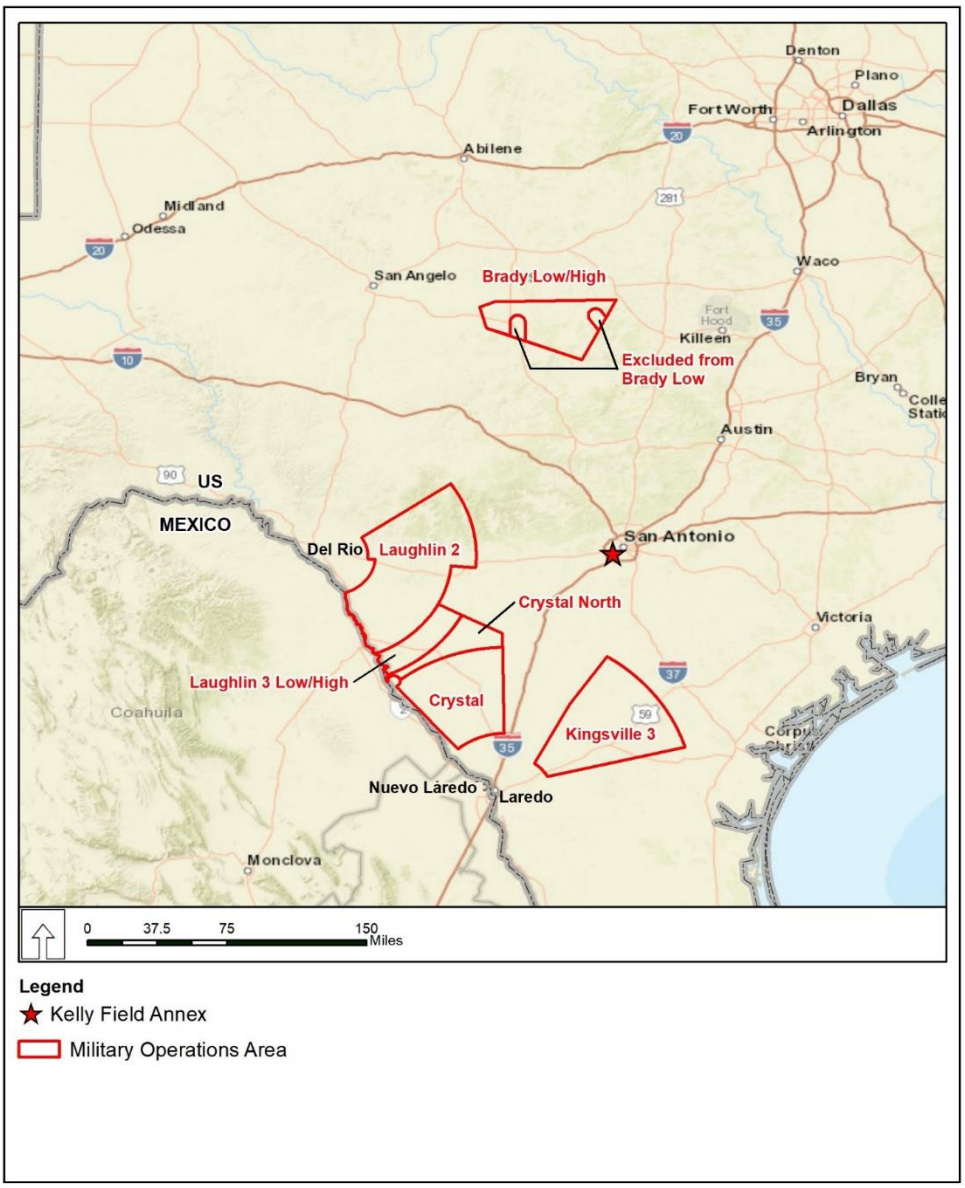


Figure 4. Military Operations Areas Proposed for Contract Adversary Air Sorties

This page intentionally left blank

Interagency and Intergovernmental Coordination and Consultations Mailing List

Mark Wolfe, Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711

Adam Zerrenner, Field Supervisor
US Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, TX 78758

Honorable William Nelson, Sr., Chairman
Comanche Nation, Oklahoma
584 NW Bingo Road
8 Miles North of Lawton, Highway 281
Lawton, OK 73507

Honorable Arthur "Butch" Blazer, President
Mescalero Apache Tribe of the Mescalero Reservation, New Mexico
P.O. Box 227
Mescalero, NM 88340

Honorable Russell Martin, President
Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653-4449

Honorable Terri Parton, President
Wichita and Affiliated Tribes
PO Box 729
1¼ Mile North on Highway 281
Andarko, OK 73005

Diane Bartlett, P.E., Civil Engineer
Bexar County Public Works
233 North Pecos Street, Suite 420
San Antonio, TX 78207

Stephen Brooks, Chief, Regulatory Branch
US Army Corps of Engineers
Fort Worth District
819 Taylor Street
Fort Worth, TX 76102

John E. Cantu, Environmental Manager
Municipal Plaza Building
114 W. Commerce, 2nd Floor
P.O. Box 839966
San Antonio, TX 78283-3966

Tiffany Harris, Communications Coordinator
Alamo Area Council of Governments
8700 Tesoro Drive #700
San Antonio, TX 78217

Russell Hooten, Habitat Assessment Biologist
Wildlife Division, Wildlife Habitat Assessment Program
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744-3291

Toby Baker, Executive Director
TCEQ
Mail Code 122
P.O. Box 13087
Austin, TX 78711-3087

Ann L. Idsal, Administrator
USEPA Region 6
1445 Ross Avenue, Suite 1200
Mail Code: 6RA
Dallas, TX 75202-2733

Patrice Melancon, P.E., CFM
Manager, Watershed Engineering Department
San Antonio River Authority
100 East Guenther Street
San Antonio, TX 78204

NEPA Coordinator
TCEQ
P.O. Box 13087
Austin, TX 78711-3087

Branch Chief
Federal Emergency Management Agency
FRC 800 North Loop 288
Denton, TX 76209-3698

Michael Segner, CFM
NFIP State Coordinator
Texas Water Development Board
1700 North Congress Avenue
Austin, TX 78701

This page intentionally left blank

Appendix A-2

Draft Environmental Assessment Distribution Letters

This page intentionally left blank

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Mr. Mark Wolfe
Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711

Dear Mr. Wolfe:

A couple of months ago, Mr. Edward Roberson (Deputy Civil Engineer, 802nd Civil Engineer Squadron) sent you a letter briefly describing the Air Force's proposal to establish an "Adversary Air" (ADAIR) operation at the Joint Base San Antonio (JBSA) Kelly Field Annex. I hope you or your staff have had the opportunity to review the summary of the Description of Proposed Action and Alternatives (DOPAA) that he provided. Now, per 36 CFR 800.11(e), I would like to provide documentation of our finding of *No Adverse Effect* and respectfully request your concurrence with this determination.

Under our Proposed Action, the Air Force would contract for 46 maintainers and 9 pilots to operate seven aircraft out of existing facilities at Kelly Field. These pilots would fly an estimated 1,200 sorties annually to provide a simulated enemy opponent during training provided by the 149th Fighter Wing located at Kelly Field. The training will take place in airspace near Kelly Field in Military Operations Areas (MOAs) which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. Most flying will take place in the Crystal, Crystal North, Laughlin 2, and Laughlin 3 MOAs located approximately 75 miles southwest of Kelly Field. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field and the Brady High and Low MOAs located approximately 110 miles north-northwest of Kelly Field. ADAIR pilots would use chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during all training, except in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions.

The U.S. Air Force (Air Force) has prepared a Draft Environmental Assessment (EA) to evaluate the potential environmental impacts associated with the proposed Combat Air Force contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field

Annex TX. The Draft EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations.

Aircraft servicing will be performed at Kelly Field in Hangars 1610 and 1612 and Building 917. Hangars 1610 and 1612 were built in 1940 and 1942, respectively, at Kelly Field during the massive buildup of US Army Air Corps airfields prior to American entry into World War II. Hangar 1610 is a utilitarian structure of multilevel, vaulted construction featuring a two-way box truss system incorporating eight aircraft bays. The hangar has a steel framework with corrugated metal siding. A two-story office block runs the length of the east façade. The hangar's character defining features include elements of the Art Moderne (molded stucco banding) and International (industrial metal windows) architectural styles. Hangar 1610 was determined eligible for inclusion in the NRHP in 2003 under Criteria A and C as a contributing element of the Kelly Field Historic District (NR# 03000626; listed on the NRHP in July 2003 [KOMATSU/Rangel, Inc. et al., 1997; Geo-Marine, Inc., 2000]).

Hangar 1612 was constructed in 1942 as an Operations Hangar and Fire and Crash Truck Station. In 1986, the hangar was severely damaged in a fire, resulting in extensive renovations and alterations to the structure. As a result, the hangar suffered a loss of integrity; therefore, Hangar 1612 has been determined not eligible for inclusion in the NRHP with SHPO concurrence.

Building 917 was constructed in 2002; therefore, it is not considered a historic building.

Kelly Field Annex has three alternatives for providing proposed operations facilities which include operations and aircraft maintenance functions. Under Alternative 1, both Operations and Maintenance office and hangar space would be consolidated in Hangar 1612 with aircrew briefings in Building 917. Alternative 2 is similar to Option 1, but Operations and Maintenance would instead be consolidated in Hangar 1610 with aircrew briefings occurring in Building 917. Under Alternative 3, Operations would be integrated with the 182d Fighter Squadron in Building 917, and maintenance space would be located in Hangar 1610. Under all three alternatives, aircraft would be parked on the East Ramp near Hangars 1610 and 1612. Hangars 1610 and 1612 are owned by Port San Antonio and leased by the Air Force.

No exterior modifications or interior renovations to any facilities or ground-disturbing activities are proposed at Kelly Field Annex. Potential interior modifications would be very minor (i.e., carpet, paint) and the defining characteristics of the building, namely the exterior facades displaying aspects of the Art Moderne and International architectural styles, would not be impacted.

Under the Proposed Action, training activities utilize special use airspace proximate to Kelly Field Annex. Special use airspace includes Military Operations Areas (MOAs), which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. The primary operational airspace that would be used by contract ADAIR aircraft includes the Crystal and Laughlin MOAs located approximately 75 miles southwest of Kelly Field Annex. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA

located approximately 80 miles south-southeast of Kelly Field Annex and the Brady MOAs located approximately 110 miles north-northwest of Kelly Field Annex.

There are nine historic resources associated with the MOAs listed in the NRHP, including one structure (a bridge), one district (a ranch and headquarters), and seven structures (one home, one jail, and five courthouses) (Table 3-23) (NPS, n.d.). No airspace modifications would be required for contract ADAIR as part of the Proposed Action and sorties within the MOAs would be performed at an altitude that would not affect historic resources.

The Air Force therefore requests written concurrence with its finding of *No Adverse Effect* regarding the Proposed Action at Kelly Field Annex. To ensure the Air Force has sufficient time to consider your input in the preparation of the EA, and for compliance with Section 106 of the NHPA, please provide comments or requests for additional information within 30 days of receipt of this letter to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil. I have designated Mr. Flores as my principle point of contact on this effort. Thank you in advance for your consideration.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.18 11:43:56 -06'00'

EDWARD L. ROBERSON, P.E.

Attachment
1. Draft EA

This page intentionally left blank

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Mr. Adam Zerrenner
Field Supervisor
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, TX 78758

Dear Mr. Zerrenner

Joint Base San Antonio (JBSA) requests concurrence with a no effect determination per Section 7 of the Endangered Species Act regarding a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA- Kelly Field Annex, TX.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attached Biological Evaluation). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

Threatened, Endangered, and Candidate Species and Critical Habitat

A review of the U.S. Fish and Wildlife Service Information for Planning and Consultation Database, Texas Parks and Wildlife Department Federal and State Listed Species of Texas Database, and the JBSA Integrated Natural Resources Management Plan identified the federally listed species with the potential to occur at Kelly Field Annex and in the Crystal and Crystal North, Laughlin 2 and Laughlin 3, Kingsville 3, and Brady High and Low Military Operations Areas (MOAs). These are described in the attached Biological Evaluation.

There would be no ground-disturbing activities on Kelly Field Annex; moreover, there would be no introduction of new, potentially toxic substances from implementation of the

Proposed Action. The activities most likely to affect listed species are aircraft overflights in the airspace where noise and visual cues could cause behavioral changes in birds and mammals. As such, there would be no impacts on listed plants, aquatic species (e.g., fish), reptiles and amphibians, invertebrates, or crustaceans.

There are eight federally listed birds and four federally listed mammals potentially occurring at Kelly Field Annex and the MOAs. The whooping crane (*Grus americana*), red knot (*Calidris canutus rufa*), and wood stork (*Mycteria americana*) are coastal species and would be unlikely to occur anywhere within the MOAs except at limited times during migration. Moreover, although historically present in some of these regions, there are no known recent occurrences of the gray wolf (*Canis lupus*) in the MOAs or nearby environs. The nearest known populations occur in the Gila Mountains of New Mexico and Arizona, and in the northern United States and Canada. In addition, while the red wolf (*Canis rufus*) is listed in counties beneath the Kingsville 3, Brady High, and Brady Low MOAs, there have been no recent known occurrences of this species and it is believed to be extirpated from Texas (Texas Tech University, 1997). As such, there are five listed birds and two listed mammals with the potential to be affected by aircraft operations on Kelly Field Annex and in the MOAs. The species with the potential to be affected by aircraft operations on Kelly Field Annex or the MOAs are further described in the attached Biological Evaluation:

- Black-Capped Vireo (*Vireo atricapilla*) - Recovery
- Piping Plover (*Charadrius melodus*) - Threatened
- Golden-Cheeked Warbler (=wood) (*Dendroica chrysoparia*) - Endangered
- Interior Least Tern (*Sterna antillarum athalassos*) - Endangered
- Bald Eagle (*Haliaeetus leucocephalus*) - Recovery
- Gulf Coast Jaguarundi (*Herpailurus* (=*Felis*) *yagouaroundi cacomitli*) - Endangered
- Ocelot (*Leopardus* [=*Felis*] *pardalis*) - Endangered

There is no critical habitat for listed species near Kelly Field Annex or beneath the proposed MOAs.

Determination of the Effects of the Proposed Action

There are no federally listed species on Kelly Field Annex. As such, there would be no effect to listed species from implementation of the Proposed Action. There would be no effect on the federally listed birds from contract ADAIR aircraft operations during training. Listed bird species that would occur in the MOAs would primarily be foraging or nesting. As such, these species would likely not be startled or at risk from aircraft strikes from aircraft flying at higher altitudes (all but an estimated 57 sorties annually within the Brady Low MOA would be above 6,000 feet). Aircraft noise in the MOAs would have no effect on bird species as the noise levels would not exceed 45 dB from ADAIR training. There would be no effect from the use of countermeasure chaff and flares as the components of chaff and flares have been found to have low toxicity and do not accumulate or magnify in food webs; chaff fibers are too large to be inhaled; and human health assessments have found the products from flare combustion have been found to not have significant adverse effects, which is likely applicable to other species (Air

Force, 1997). While birds and bats may experience disorientation if they fly through a cloud of chaff, the effect would be short and the potential for injury is low due to the low mass and diffuse nature of the chaff, the low resistance times chaff is in the air, and the localized nature of the chaff release (Air Force, 1997).

The listed mammals would potentially only be affected by aircraft overflights if the training activities elicited negative behavioral responses. It is highly unlikely that either aircraft movement or noise emissions, especially at higher altitudes, would elicit a response from mammals. Noise from contract ADAIR aircraft would not exceed 45 dB and would therefore have no effect on the listed mammal species. Aircraft movement would not be visible to mammals unless an individual was at the exact location at the moment in which an aircraft traveling at high speed at a relatively low altitude passed directly overhead. These occurrences with contract ADAIR aircraft would be so rare as to be negligible and may not even generate a startle response if an interaction occurred. Lastly, extensive studies have shown that the use of chaff and flares has no adverse impact on wildlife, their components have been shown to have no or low toxicity and not known to accumulate or magnify in food webs (Air Force, 1997). As such, the contract ADAIR training in would have no effect on federally listed mammals.

Sonic booms from supersonic aircraft movement could cause a startle response by the listed species; however, sonic booms would be relatively rare events during ADAIR training in the MOAs, and the sonic boom and post-boom rumbling would be similar to what wildlife experience during a thunderstorm, and thunderstorms do occur with relative frequency in the region; therefore, sonic booms from supersonic aircraft movement would have no effect on listed species.

I am requesting your written concurrence with our *no effect* determination. Address all comments and correspondence to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Correspondence is encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2019.01.15 10:31:24 -06'00'

EDWARD L. ROBERSON, P.E.

References

Air Force. 1997. Environmental Effects of Self-protection Chaff and Flares: Final Report. Prepared for Headquarters Air Combat Command, Langley Air Force Base, Virginia.

Texas Tech University. 1997. The Mammals of Texas – Online Edition.
<http://www.nsrl.ttu.edu/tmot1>. Accessed 1 October 2018.

Attachment:
1. Biological Evaluation

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. William Nelson, Sr.
Chairman, Comanche Nation, Oklahoma
HC-32, Box 1720
584 NW Bingo Road, Highway 281
Lawton, OK 73520

Dear Chairman Nelson

A couple of months ago, Mr. Edward Roberson (Deputy Civil Engineer, 802nd Civil Engineer Squadron) sent you a letter briefly describing the Air Force's proposal to establish an "Adversary Air" (ADAIR) operation at the Joint Base San Antonio (JBSA) Kelly Field Annex. I hope you or your staff have had the opportunity to review the Description of Proposed Action and Alternatives (DOPAA) that he provided. Now I would like to follow up by inviting the Comanche Nation, Oklahoma to engage in government-to-government consultation with Joint Base San Antonio (JBSA) – Lackland on the proposal.

Under our proposed action, the Air Force would contract for 46 maintainers and 9 pilots to operate seven aircraft out of existing facilities at Kelly Field. These pilots would fly an estimated 1,200 sorties annually to provide a simulated enemy opponent during training provided by the 149th Fighter Wing located at Kelly Field. The training will take place in airspace near Kelly Field in Military Operations Areas (MOAs) which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. Most flying will take place in the Crystal, Crystal North, Laughlin 2, and Laughlin 3 MOAs located approximately 75 miles southwest of Kelly Field. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field and the Brady High and Low MOAs located approximately 110 miles north-northwest of Kelly Field. ADAIR pilots would use chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during all training, except in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions.

Aircraft servicing will be performed at Kelly Field in Hangars 1610 and 1612 and Building 917. While the hangars are eligible for inclusion in the national Register of Historic Places (NRHP) as a contributing element of the Kelly Field Historic District, only minimal interior modifications are necessary. No exterior modifications to any facilities or ground-disturbing

activities are proposed. Additionally, there are nine historic resources associated with the MOAs listed in the NRHP, including one structure (a bridge), one district (a ranch and headquarters), and seven structures (one home, one jail, and five courthouses) (Draft EA, Table 3-23). No airspace modifications would be required for contract ADAIR as part of the Proposed Action and sorties within the MOAs would be performed at an altitude that would not affect historic resources.

I understand that, to date, the Comanche Nation, Oklahoma has not identified any properties of religious and cultural significance on Kelly Field. We now invite you to identify any such properties on the airfield or under the MOAs that might be affected by our proposed action. Please let us know if any of these properties are present, along with any supporting information on their eligibility for the NRHP. To ensure that we can make full use of any information you provide, it would be helpful to hear back from you by 15 March 2019. I have designated Mr. Arlan Kalina, our Installation Tribal Liaison Officer as my principal point of contact on this consultation. He can be reached at (210) 652-7461. Thank you in advance for your consideration.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636

Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.18 11:57:09 -06'00'

EDWARD L. ROBERSON, P.E.

c.c. Texas Historical Commission

Attachment
1. Proposed Action Maps
2. Draft EA, Table 3-23

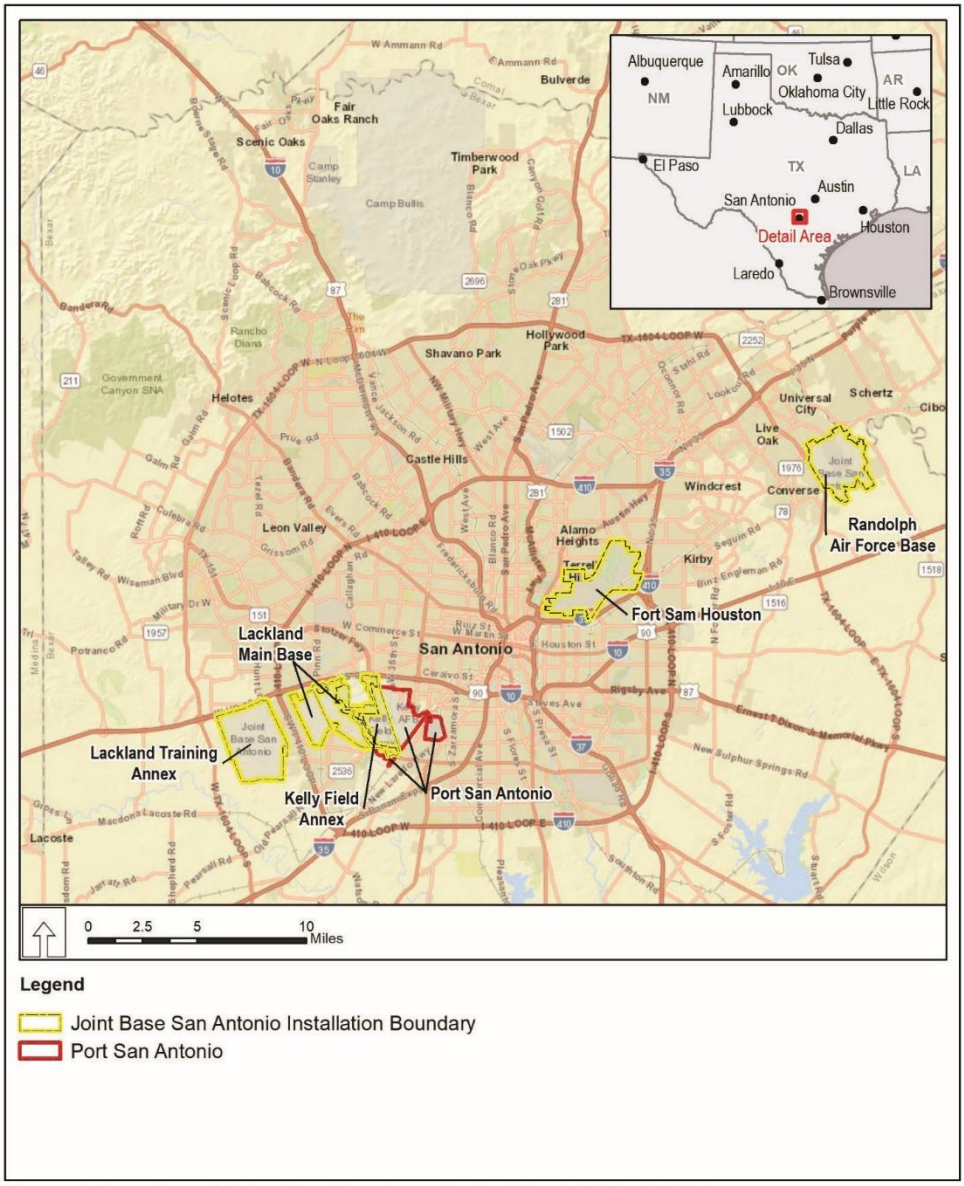


Figure 1. Location of Joint Base San Antonio-Lackland, Kelly Field Annex.

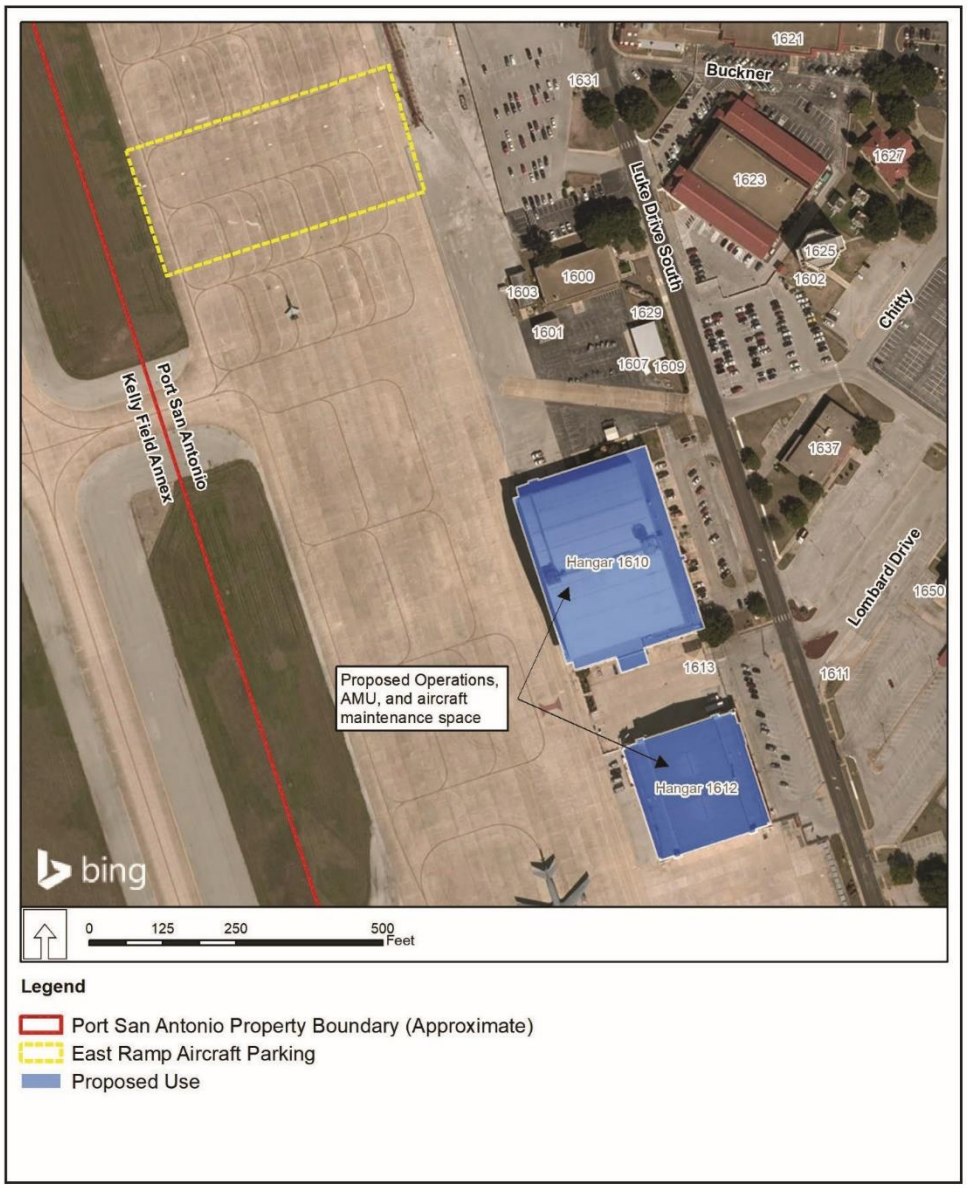


Figure 2. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space at Hangars 1612 and 1610 and Aircraft Parking on the East Ramp.

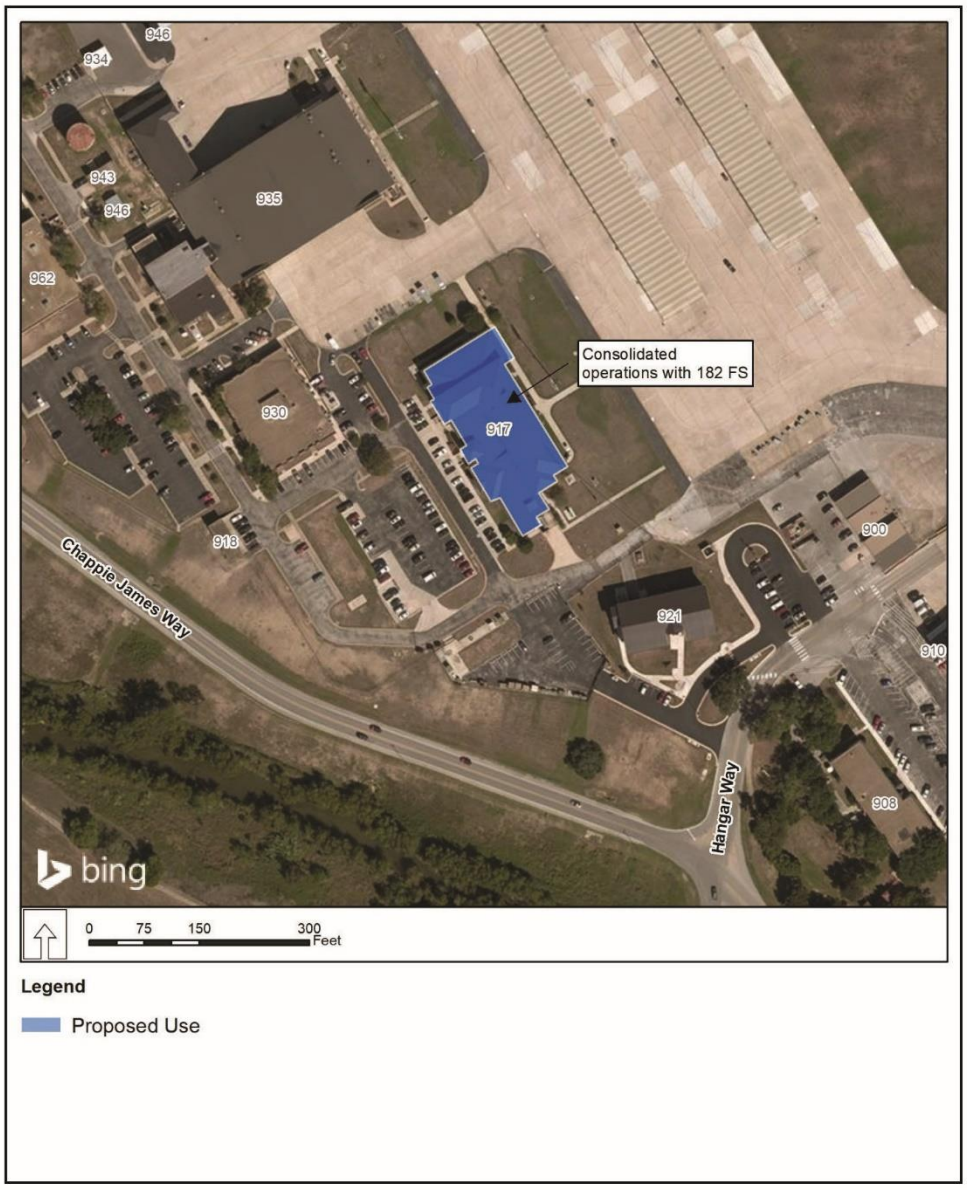


Figure 3. Proposed Location for Operations Space at Building 917.

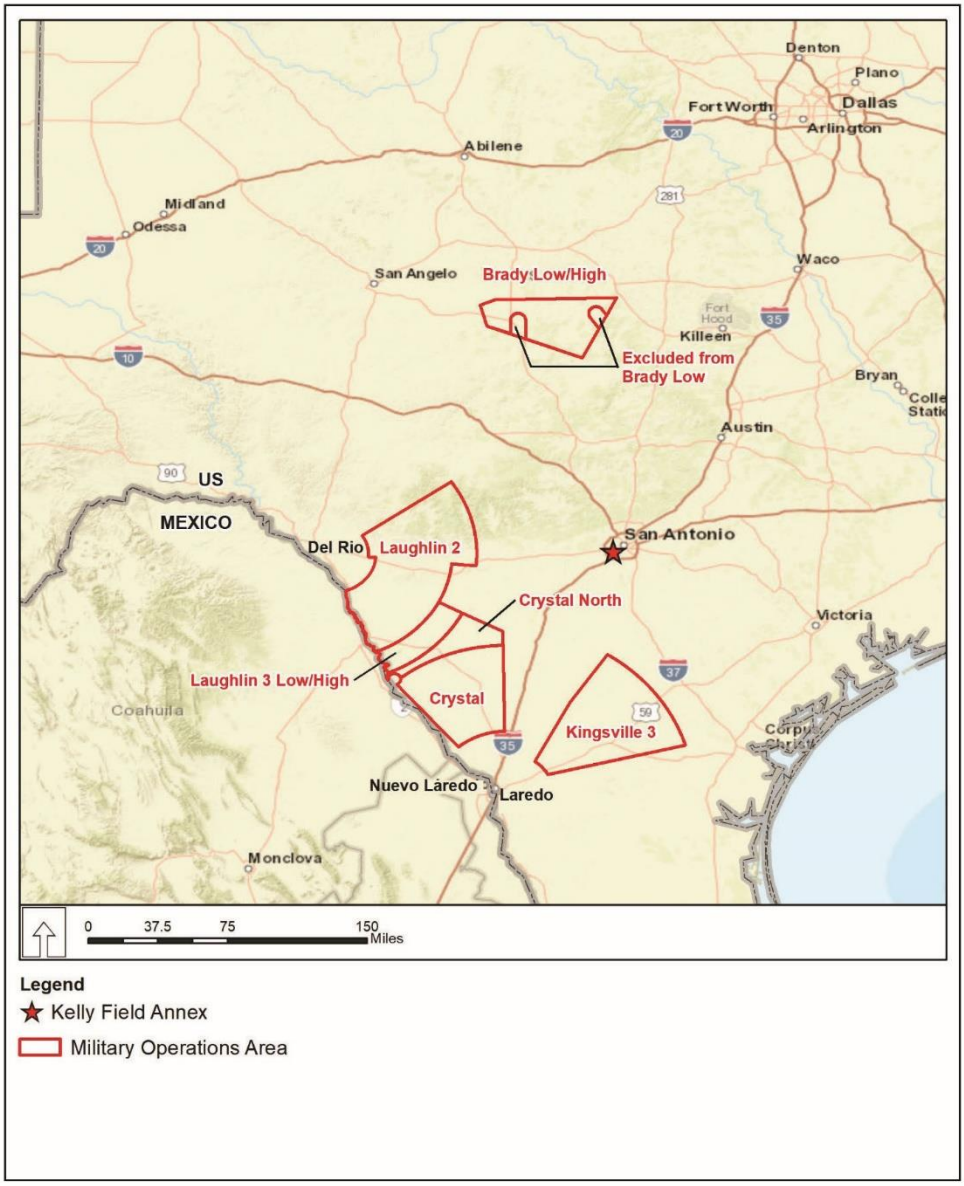


Figure 4. Military Operations Areas Proposed for Contract Adversary Air Sorties

Table 3--1
National Register of Historic Places Listed Resources Under the Airspace[1]

Military Operating Area	Resource	Type	Reference Number
Brady High	McCulloch County Courthouse	Building	77001515
Brady High	Old McCulloch County Jail	Building	75002073
Brady High	San Saba County Courthouse	Building	03000328
Crystal	Dimmit County Courthouse	Building	84001652
Crystal	Richardson, Asher and Mary Isabelle, House	Building	88002539
Crystal	Valenzuela Ranch Headquarters	District	85001562
Laughlin 2	1911 Kinney County Courthouse	Building	04000230
Laughlin 2	Maverick County Courthouse	Building	80004141
Laughlin 2	State Highway 3 Bridge at the Nueces River	Structure	96001108

Note:
[1] The condition is defined as "likely but not guaranteed to be extant" (or not guaranteed to be standing).

This page intentionally left blank

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. Arthur "Butch" Blazer
President, Mescalero Apache Tribe of the Mescalero Reservation
P.O. Box 227
Mescalero, NM 88340

Dear President Blazer

A couple of months ago, Mr. Edward Roberson (Deputy Civil Engineer, 802nd Civil Engineer Squadron) sent you a letter briefly describing the Air Force's proposal to establish an "Adversary Air" (ADAIR) operation at the Joint Base San Antonio (JBSA) Kelly Field Annex. I hope you or your staff have had the opportunity to review the Description of Proposed Action and Alternatives (DOPAA) that he provided. Now I would like to follow up by inviting the Mescalero Apache Tribe of the Mescalero Reservation to engage in government-to-government consultation with Joint Base San Antonio (JBSA) – Lackland on the proposal.

Under our proposed action, the Air Force would contract for 46 maintainers and 9 pilots to operate seven aircraft out of existing facilities at Kelly Field. These pilots would fly an estimated 1,200 sorties annually to provide a simulated enemy opponent during training provided by the 149th Fighter Wing located at Kelly Field. The training will take place in airspace near Kelly Field in Military Operations Areas (MOAs) which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. Most flying will take place in the Crystal, Crystal North, Laughlin 2, and Laughlin 3 MOAs located approximately 75 miles southwest of Kelly Field. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field and the Brady High and Low MOAs located approximately 110 miles north-northwest of Kelly Field. ADAIR pilots would use chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during all training, except in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions.

Aircraft servicing will be performed at Kelly Field in Hangars 1610 and 1612 and Building 917. While the hangars are eligible for inclusion in the national Register of Historic Places (NRHP) as a contributing element of the Kelly Field Historic District, only minimal interior modifications are necessary. No exterior modifications to any facilities or ground-disturbing activities are proposed. Additionally, there are nine historic resources associated with the MOAs

listed in the NRHP, including one structure (a bridge), one district (a ranch and headquarters), and seven structures (one home, one jail, and five courthouses) (Draft EA, Table 3-23). No airspace modifications would be required for contract ADAIR as part of the Proposed Action and sorties within the MOAs would be performed at an altitude that would not affect historic resources.

I understand that, to date, the Mescalero Apache Tribe has not identified any properties of religious and cultural significance on Kelly Field. We now invite you to identify any such properties on the airfield or under the MOAs that might be affected by our proposed action. Please let us know if any of these properties are present, along with any supporting information on their eligibility for the NRHP. To ensure that we can make full use of any information you provide, it would be helpful to hear back from you by 15 March 2019. I have designated Mr. Arlan Kalina, our Installation Tribal Liaison Officer as my principal point of contact on this consultation. He can be reached at (210) 652-7461. Thank you in advance for your consideration.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.18 11:59:07 -06'00'

EDWARD L. ROBERSON, P.E.

c.c. Texas Historical Commission

Attachment
1. Proposed Action Maps
2. Draft EA, Table 3-23

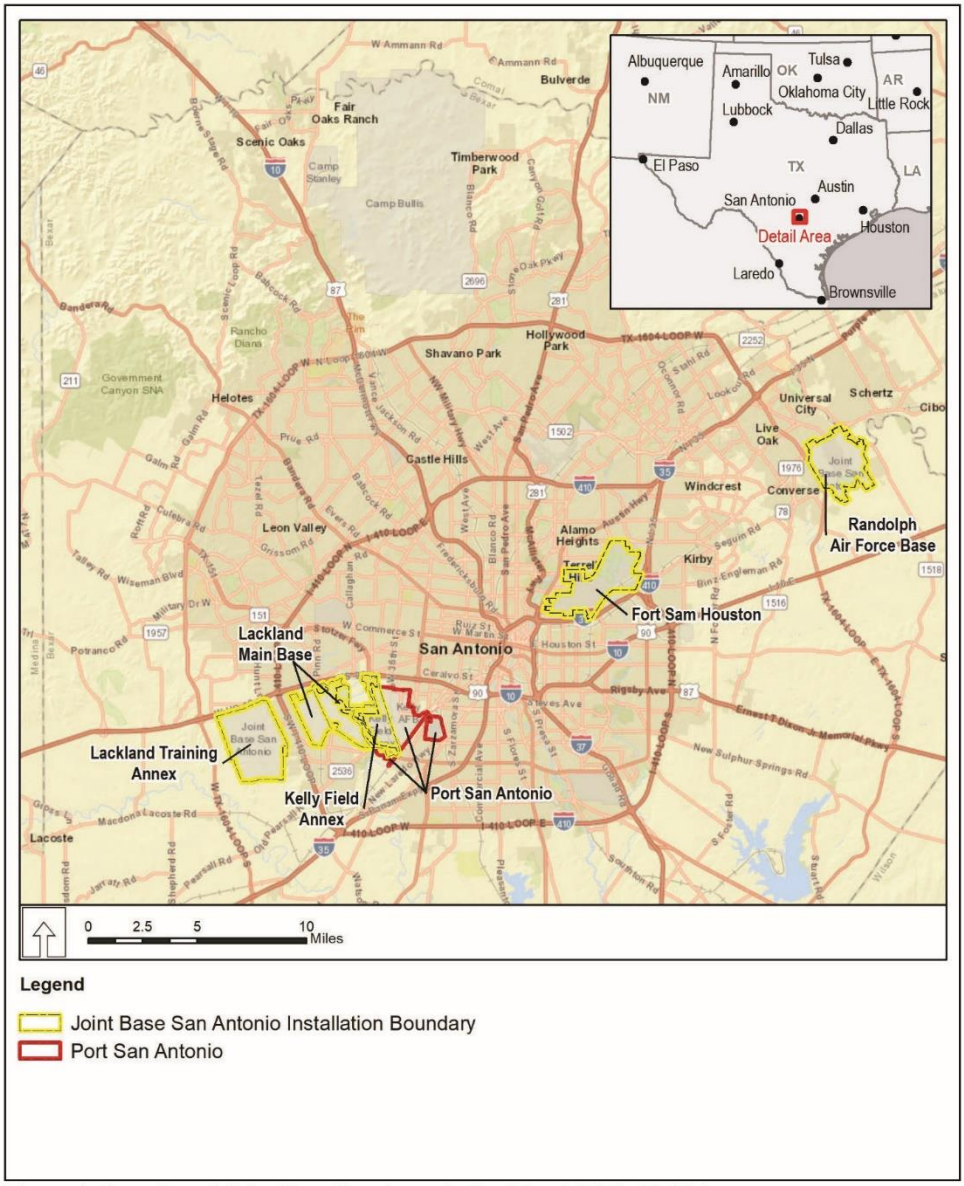


Figure 1. Location of Joint Base San Antonio-Lackland, Kelly Field Annex.

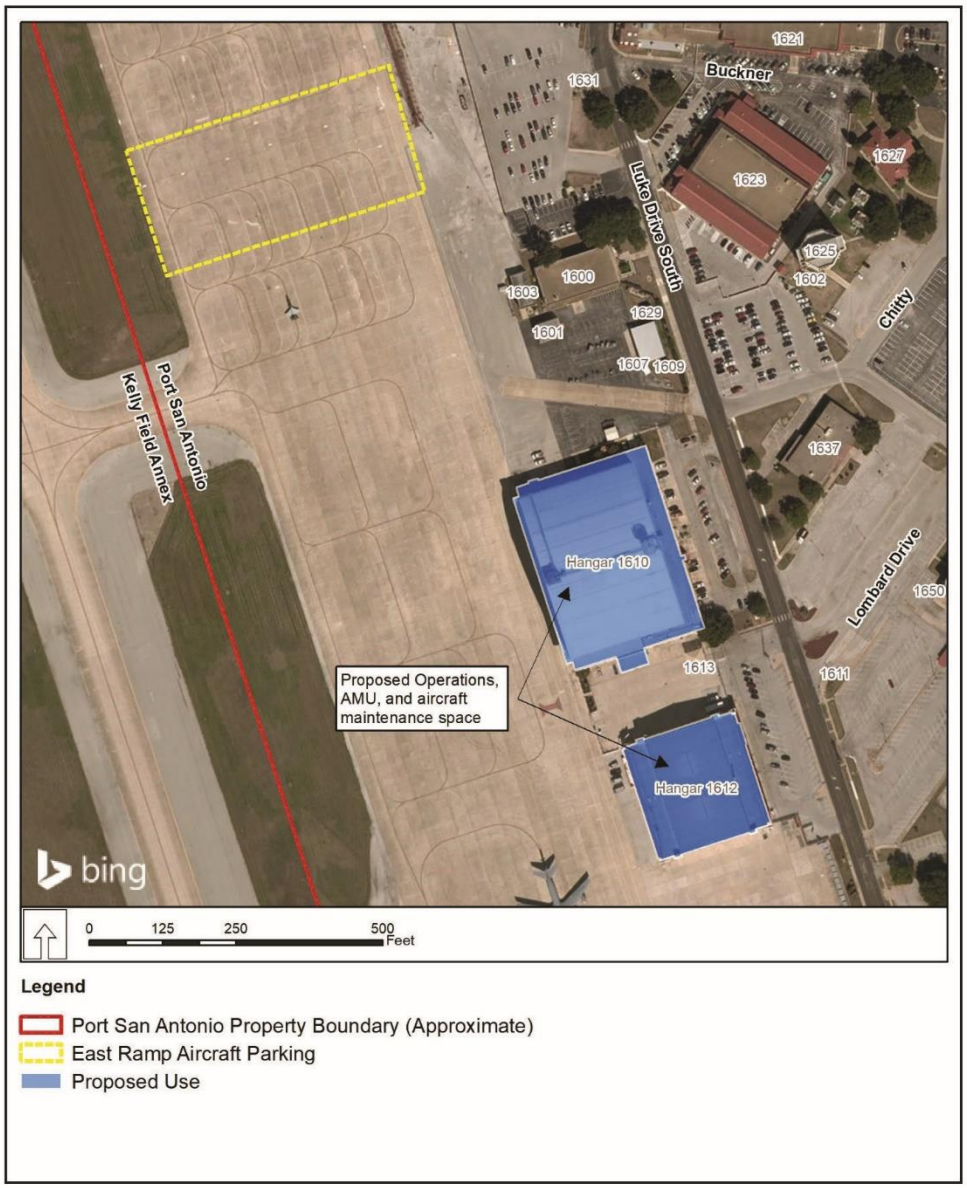


Figure 2. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space at Hangars 1612 and 1610 and Aircraft Parking on the East Ramp.

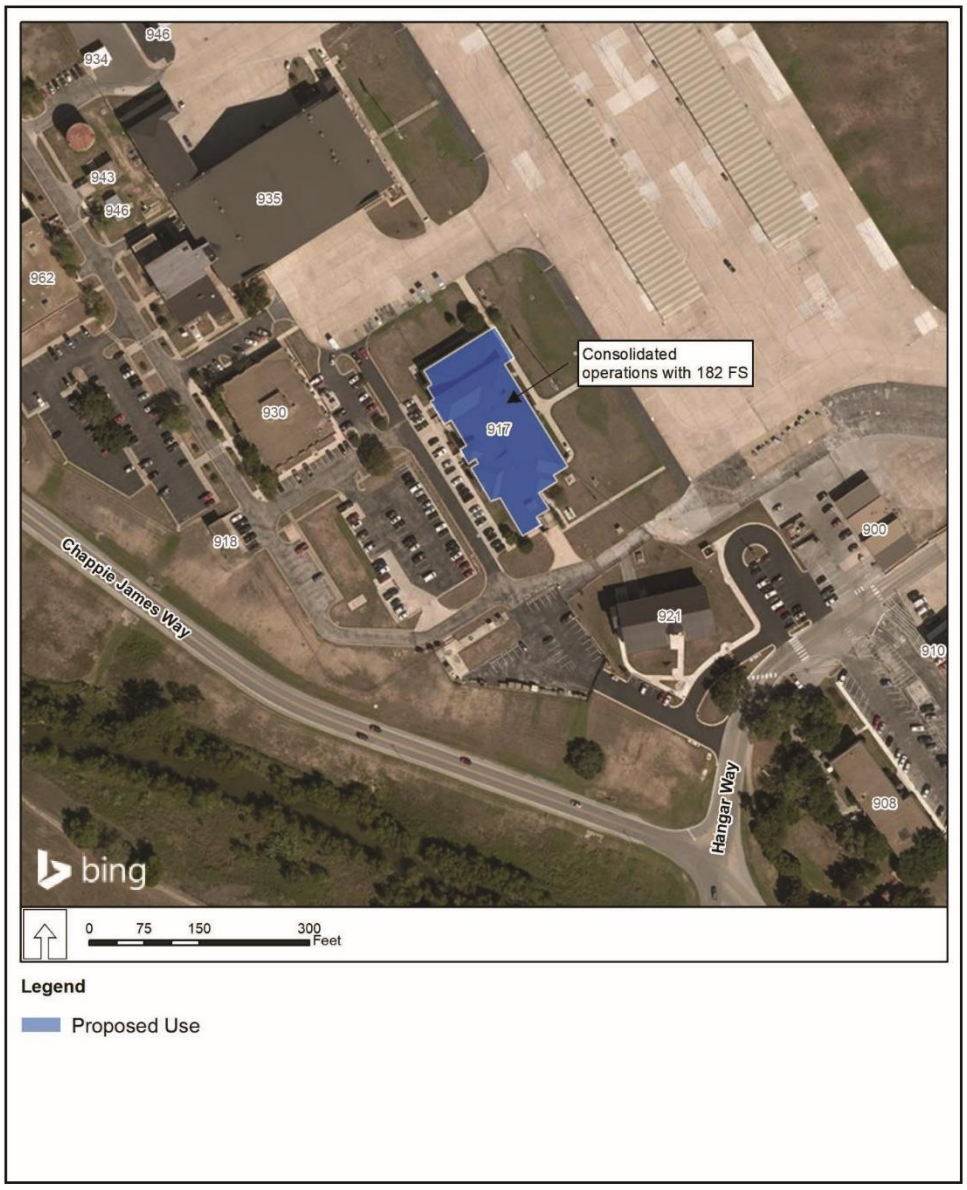


Figure 3. Proposed Location for Operations Space at Building 917.

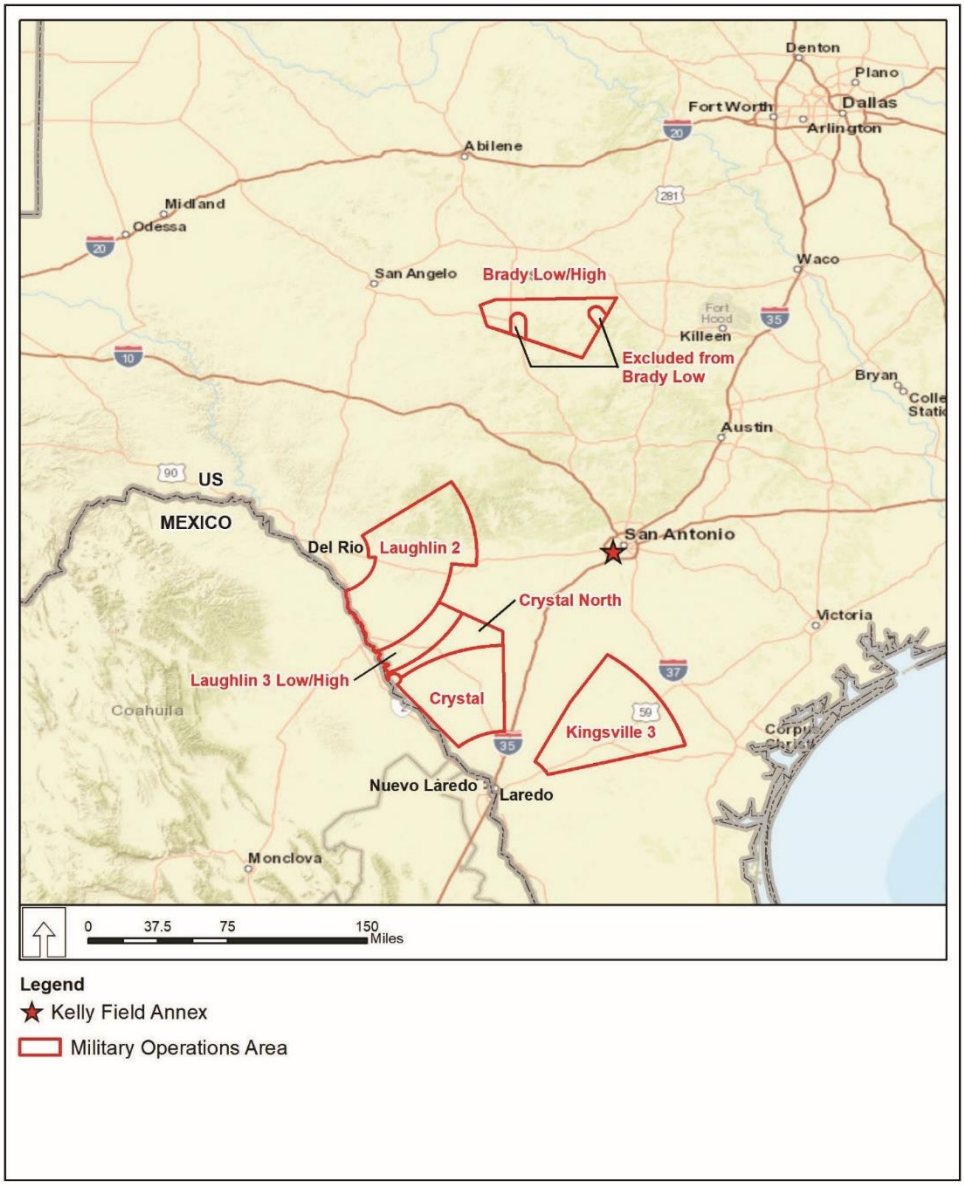


Figure 4. Military Operations Areas Proposed for Contract Adversary Air Sorties

Table 3--1
National Register of Historic Places Listed Resources Under the Airspace[1]

Military Operating Area	Resource	Type	Reference Number
Brady High	McCulloch County Courthouse	Building	77001515
Brady High	Old McCulloch County Jail	Building	75002073
Brady High	San Saba County Courthouse	Building	03000328
Crystal	Dimmit County Courthouse	Building	84001652
Crystal	Richardson, Asher and Mary Isabelle, House	Building	88002539
Crystal	Valenzuela Ranch Headquarters	District	85001562
Laughlin 2	1911 Kinney County Courthouse	Building	04000230
Laughlin 2	Maverick County Courthouse	Building	80004141
Laughlin 2	State Highway 3 Bridge at the Nueces River	Structure	96001108

Note:
[1] The condition is defined as "likely but not guaranteed to be extant" (or not guaranteed to be standing).

This page intentionally left blank

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. Russell Martin
President, Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653-4499

Dear President Martin

A couple of months ago, Mr. Edward Roberson (Deputy Civil Engineer, 802nd Civil Engineer Squadron) sent you a letter briefly describing the Air Force's proposal to establish an "Adversary Air" (ADAIR) operation at the Joint Base San Antonio (JBSA) Kelly Field Annex. I hope you or your staff have had the opportunity to review the Description of Proposed Action and Alternatives (DOPAA) that he provided. Now I would like to follow up by inviting the Tonkawa Tribe of Indians of Oklahoma to engage in government-to-government consultation with Joint Base San Antonio (JBSA) – Lackland on the proposal.

Under our proposed action, the Air Force would contract for 46 maintainers and 9 pilots to operate seven aircraft out of existing facilities at Kelly Field. These pilots would fly an estimated 1,200 sorties annually to provide a simulated enemy opponent during training provided by the 149th Fighter Wing located at Kelly Field. The training will take place in airspace near Kelly Field in Military Operations Areas (MOAs) which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. Most flying will take place in the Crystal, Crystal North, Laughlin 2, and Laughlin 3 MOAs located approximately 75 miles southwest of Kelly Field. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field and the Brady High and Low MOAs located approximately 110 miles north-northwest of Kelly Field. ADAIR pilots would use chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during all training, except in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions.

Aircraft servicing will be performed at Kelly Field in Hangars 1610 and 1612 and Building 917. While the hangars are eligible for inclusion in the national Register of Historic Places (NRHP) as a contributing element of the Kelly Field Historic District, only minimal interior modifications are necessary. No exterior modifications to any facilities or ground-disturbing activities are proposed. Additionally, there are nine historic resources associated with the MOAs

listed in the NRHP, including one structure (a bridge), one district (a ranch and headquarters), and seven structures (one home, one jail, and five courthouses) (Draft EA, Table 3-23). No airspace modifications would be required for contract ADAIR as part of the Proposed Action and sorties within the MOAs would be performed at an altitude that would not affect historic resources.

I understand that, to date, the Tonkawa Tribe of Indians of Oklahoma has not identified any properties of religious and cultural significance on Kelly Field. We now invite you to identify any such properties on the airfield or under the MOAs that might be affected by our proposed action. Please let us know if any of these properties are present, along with any supporting information on their eligibility for the NRHP. To ensure that we can make full use of any information you provide, it would be helpful to hear back from you by 15 March 2019. I have designated Mr. Arlan Kalina, our Installation Tribal Liaison Officer as my principal point of contact on this consultation. He can be reached at (210) 652-7461. Thank you in advance for your consideration.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636

Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.18 11:58:09 -06'00'

EDWARD L. ROBERSON, P.E.

c.c. Texas Historical Commission

Attachment
1. Proposed Action Maps
2. Draft EA, Table 3-23

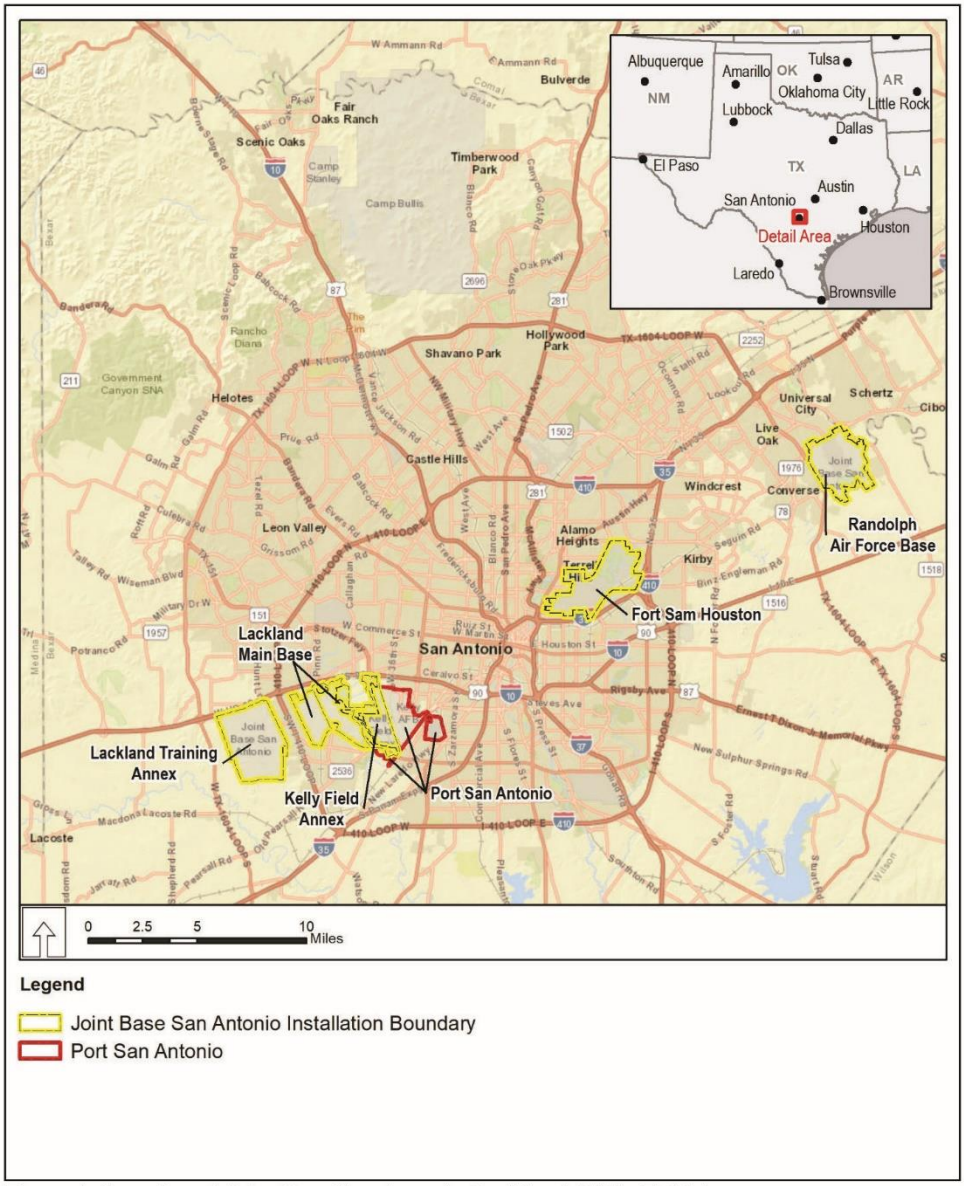


Figure 1. Location of Joint Base San Antonio-Lackland, Kelly Field Annex.

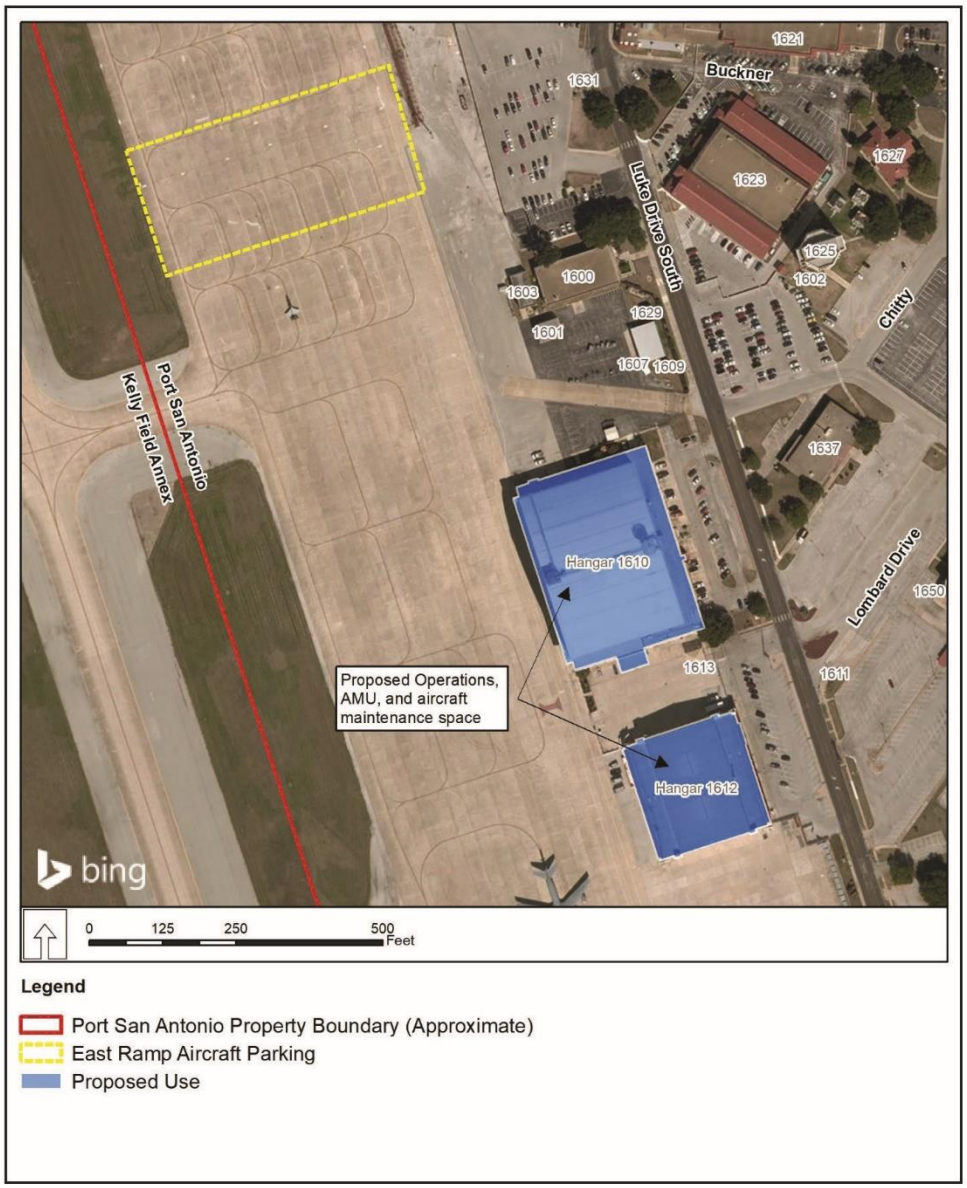


Figure 2. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space at Hangars 1612 and 1610 and Aircraft Parking on the East Ramp.

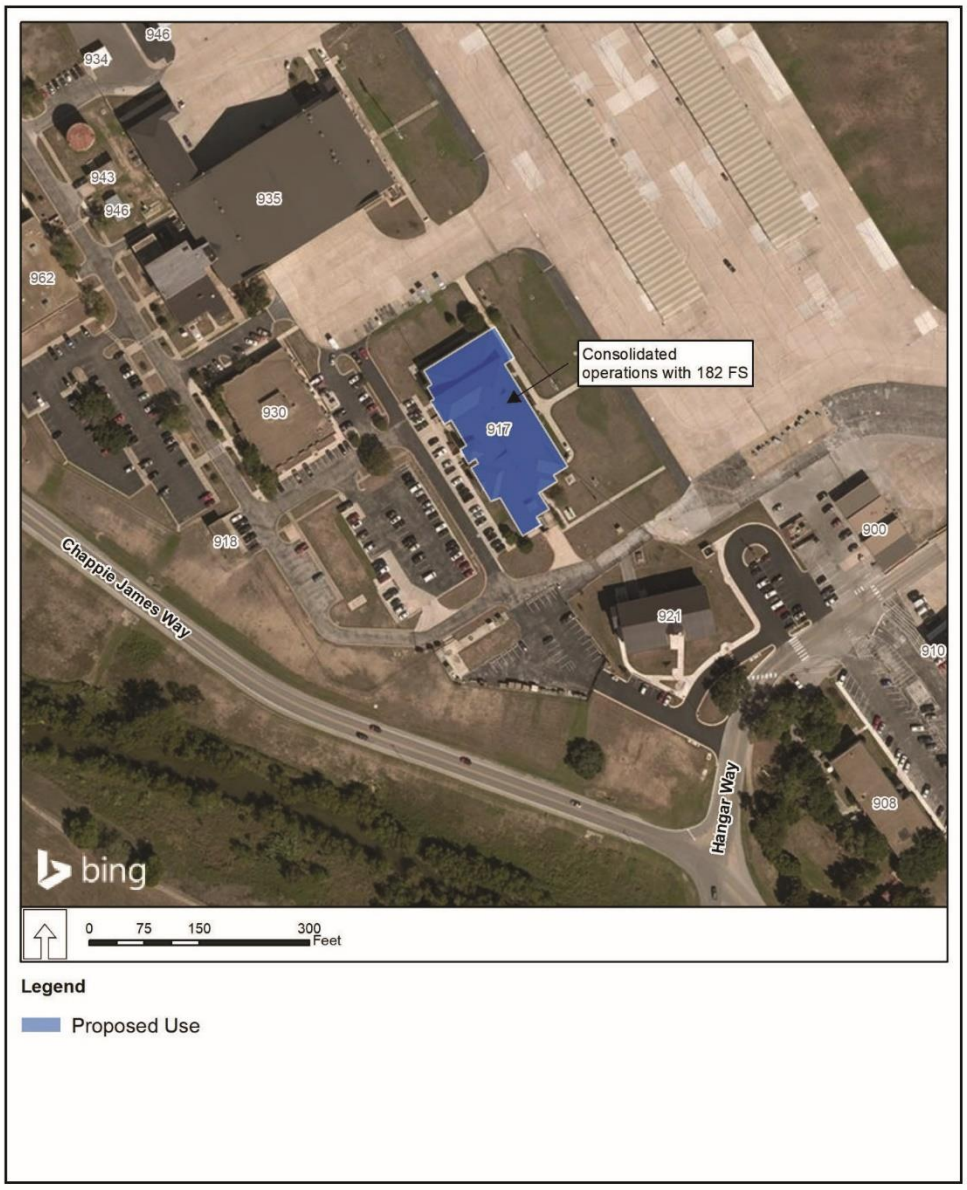


Figure 3. Proposed Location for Operations Space at Building 917.

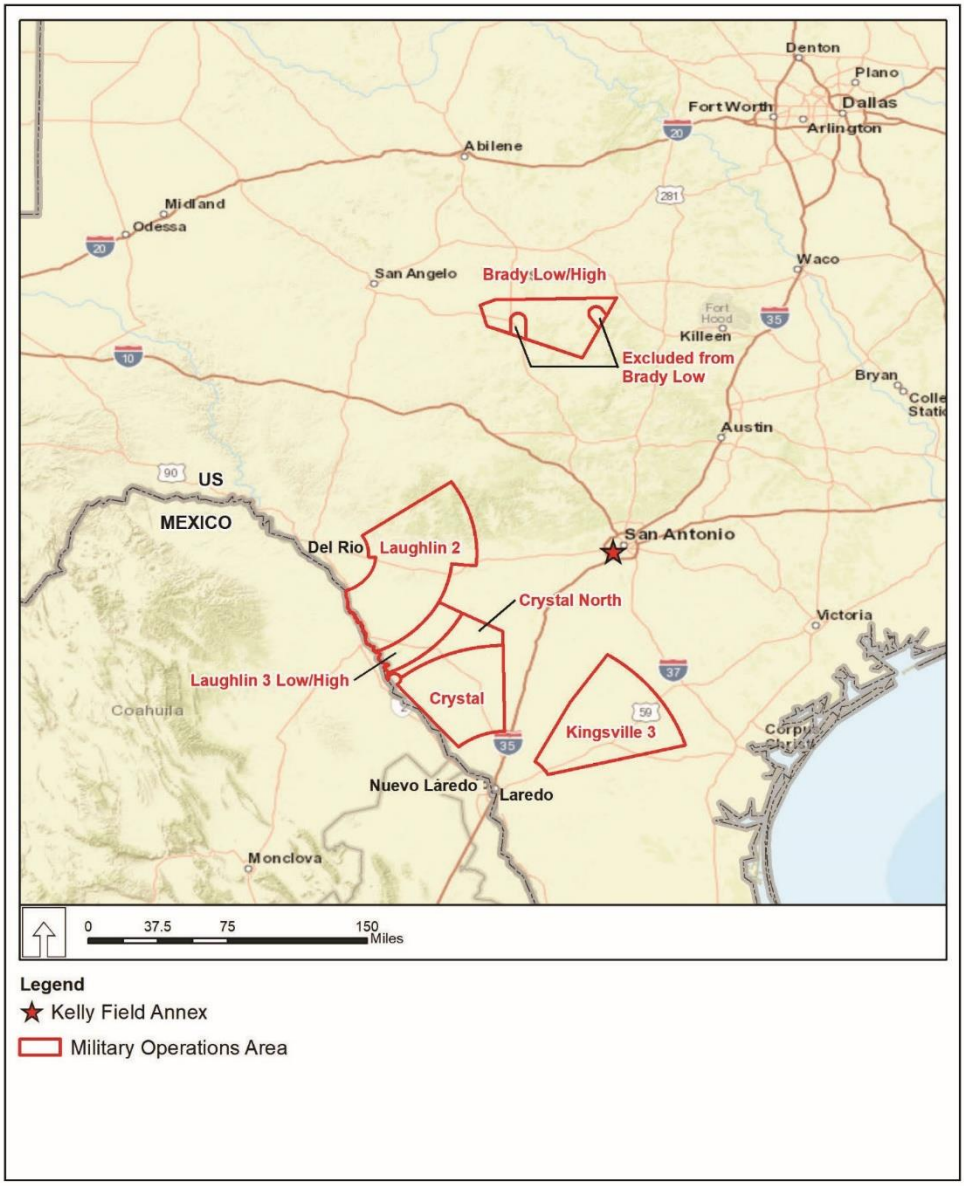


Figure 4. Military Operations Areas Proposed for Contract Adversary Air Sorties

Table 3--1
National Register of Historic Places Listed Resources Under the Airspace[1]

Military Operating Area	Resource	Type	Reference Number
Brady High	McCulloch County Courthouse	Building	77001515
Brady High	Old McCulloch County Jail	Building	75002073
Brady High	San Saba County Courthouse	Building	03000328
Crystal	Dimmit County Courthouse	Building	84001652
Crystal	Richardson, Asher and Mary Isabelle, House	Building	88002539
Crystal	Valenzuela Ranch Headquarters	District	85001562
Laughlin 2	1911 Kinney County Courthouse	Building	04000230
Laughlin 2	Maverick County Courthouse	Building	80004141
Laughlin 2	State Highway 3 Bridge at the Nueces River	Structure	96001108

Note:

[1] The condition is defined as "likely but not guaranteed to be extant" (or not guaranteed to be standing).

This page intentionally left blank

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Ms. Terri Parton
President, Wichita and Affiliated Tribes
P.O. Box 729
Andarko, OK 73005

Dear President Parton

A couple of months ago, Mr. Edward Roberson (Deputy Civil Engineer, 802nd Civil Engineer Squadron) sent you a letter briefly describing the Air Force's proposal to establish an "Adversary Air" (ADAIR) operation at the Joint Base San Antonio (JBSA) Kelly Field Annex. I hope you or your staff have had the opportunity to review the Description of Proposed Action and Alternatives (DOPAA) that he provided. Now I would like to follow up by inviting the Wichita and Affiliated Tribes to engage in government-to-government consultation with Joint Base San Antonio (JBSA) – Lackland on the proposal.

Under our proposed action, the Air Force would contract for 46 maintainers and 9 pilots to operate seven aircraft out of existing facilities at Kelly Field. These pilots would fly an estimated 1,200 sorties annually to provide a simulated enemy opponent during training provided by the 149th Fighter Wing located at Kelly Field. The training will take place in airspace near Kelly Field in Military Operations Areas (MOAs) which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. Most flying will take place in the Crystal, Crystal North, Laughlin 2, and Laughlin 3 MOAs located approximately 75 miles southwest of Kelly Field. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field and the Brady High and Low MOAs located approximately 110 miles north-northwest of Kelly Field. ADAIR pilots would use chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during all training, except in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions.

Aircraft servicing will be performed at Kelly Field in Hangars 1610 and 1612 and Building 917. While the hangars are eligible for inclusion in the national Register of Historic Places (NRHP) as a contributing element of the Kelly Field Historic District, only minimal interior modifications are necessary. No exterior modifications to any facilities or ground-disturbing activities are proposed. Additionally, there are nine historic resources associated with the MOAs listed in the NRHP, including one structure (a bridge), one district (a ranch and headquarters), and

seven structures (one home, one jail, and five courthouses) (Draft EA, Table 3-23). No airspace modifications would be required for contract ADAIR as part of the Proposed Action and sorties within the MOAs would be performed at an altitude that would not affect historic resources.

I understand that, to date, the Wichita and Affiliated Tribes has not identified any properties of religious and cultural significance on Kelly Field. We now invite you to identify any such properties on the airfield or under the MOAs that might be affected by our proposed action. Please let us know if any of these properties are present, along with any supporting information on their eligibility for the NRHP. To ensure that we can make full use of any information you provide, it would be helpful to hear back from you by 15 March 2019. I have designated Mr. Arlan Kalina, as our Installation Tribal Liaison Officer as my principal point of contact on this consultation. He can be reached at (210) 652-7461. Thank you in advance for your consideration.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.18 12:00:12 -06'00'

EDWARD L. ROBERSON, P. E.

c.c. Texas Historical Commission

Attachment
1. Proposed Action Maps
2. Draft EA, Table 3-23

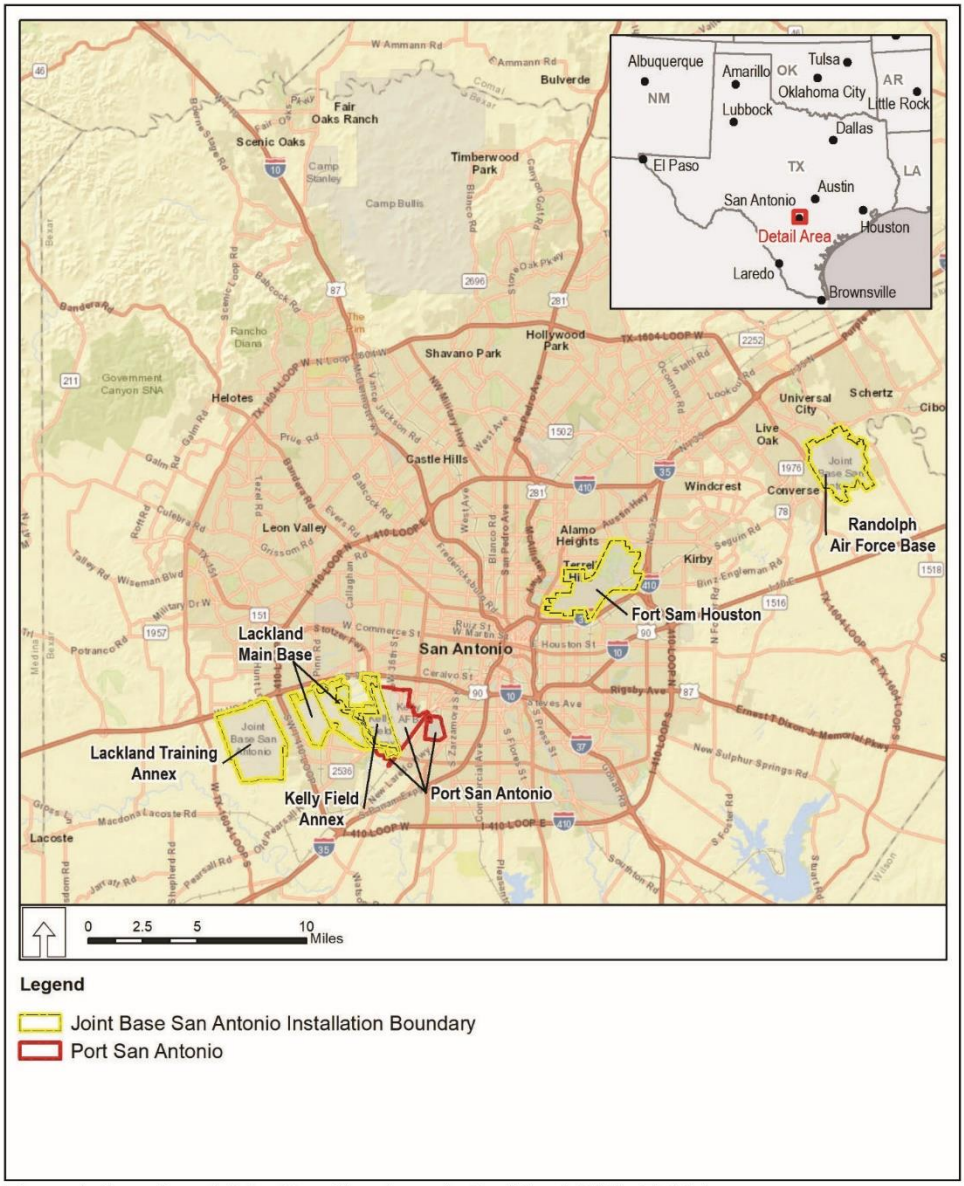


Figure 1. Location of Joint Base San Antonio-Lackland, Kelly Field Annex.

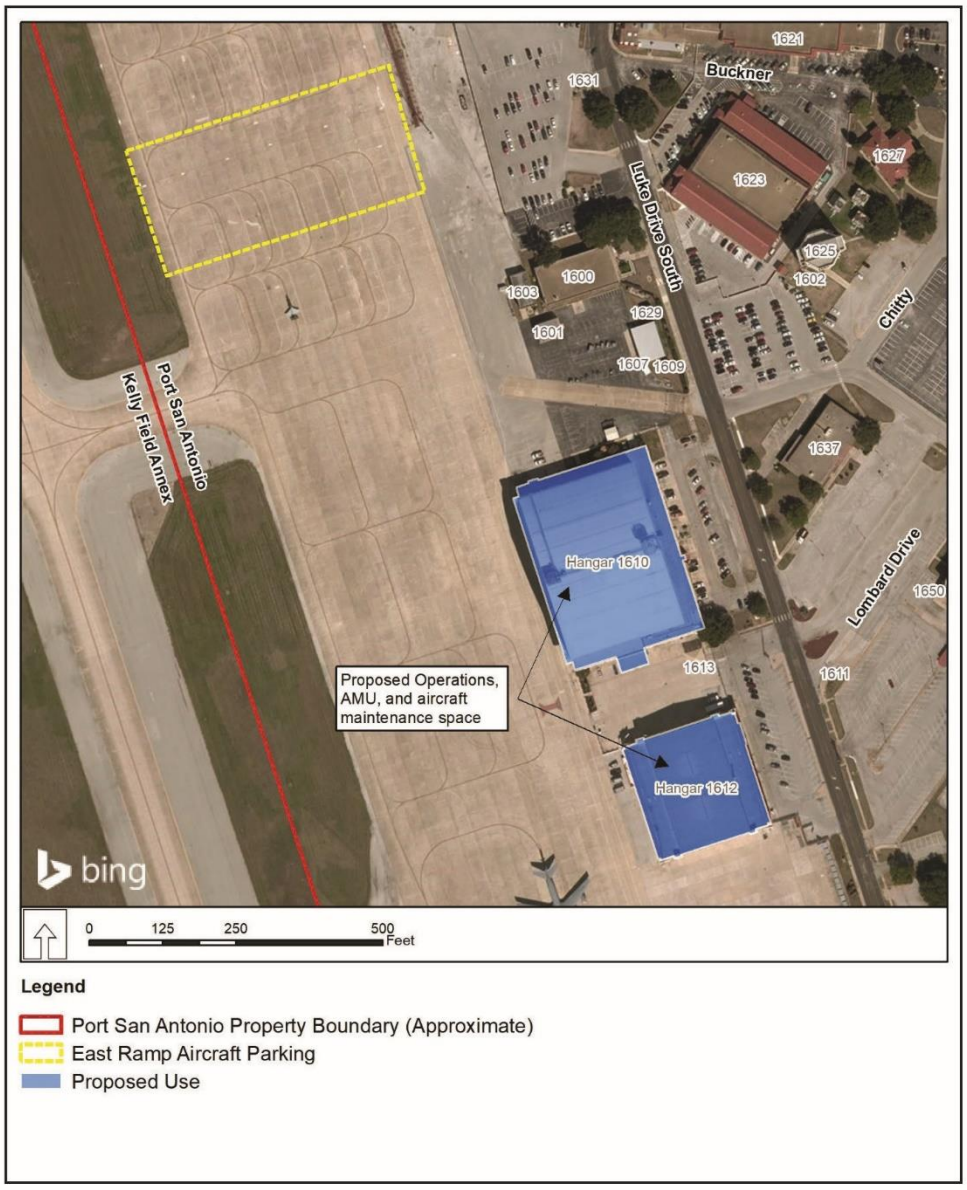


Figure 2. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space at Hangars 1612 and 1610 and Aircraft Parking on the East Ramp.

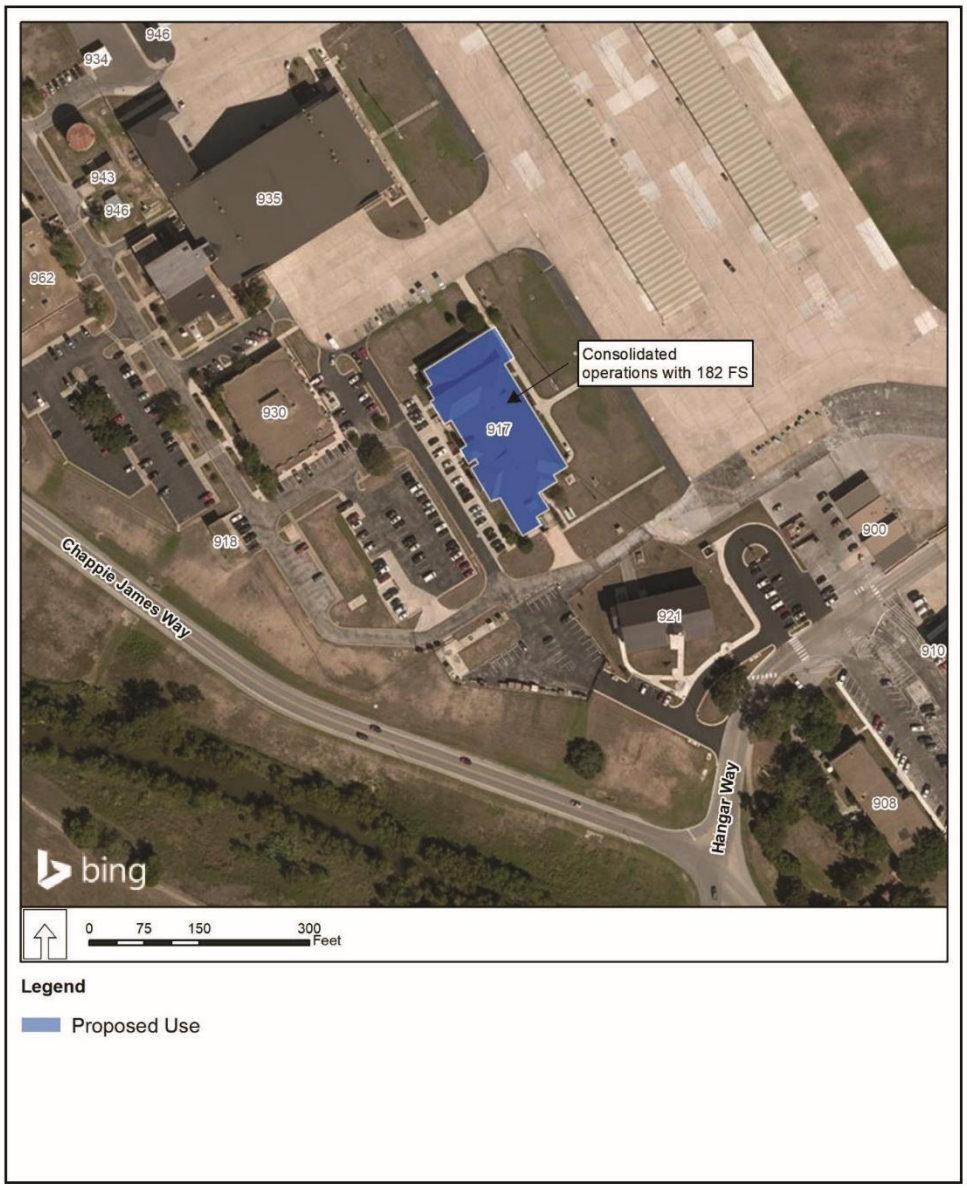


Figure 3. Proposed Location for Operations Space at Building 917.

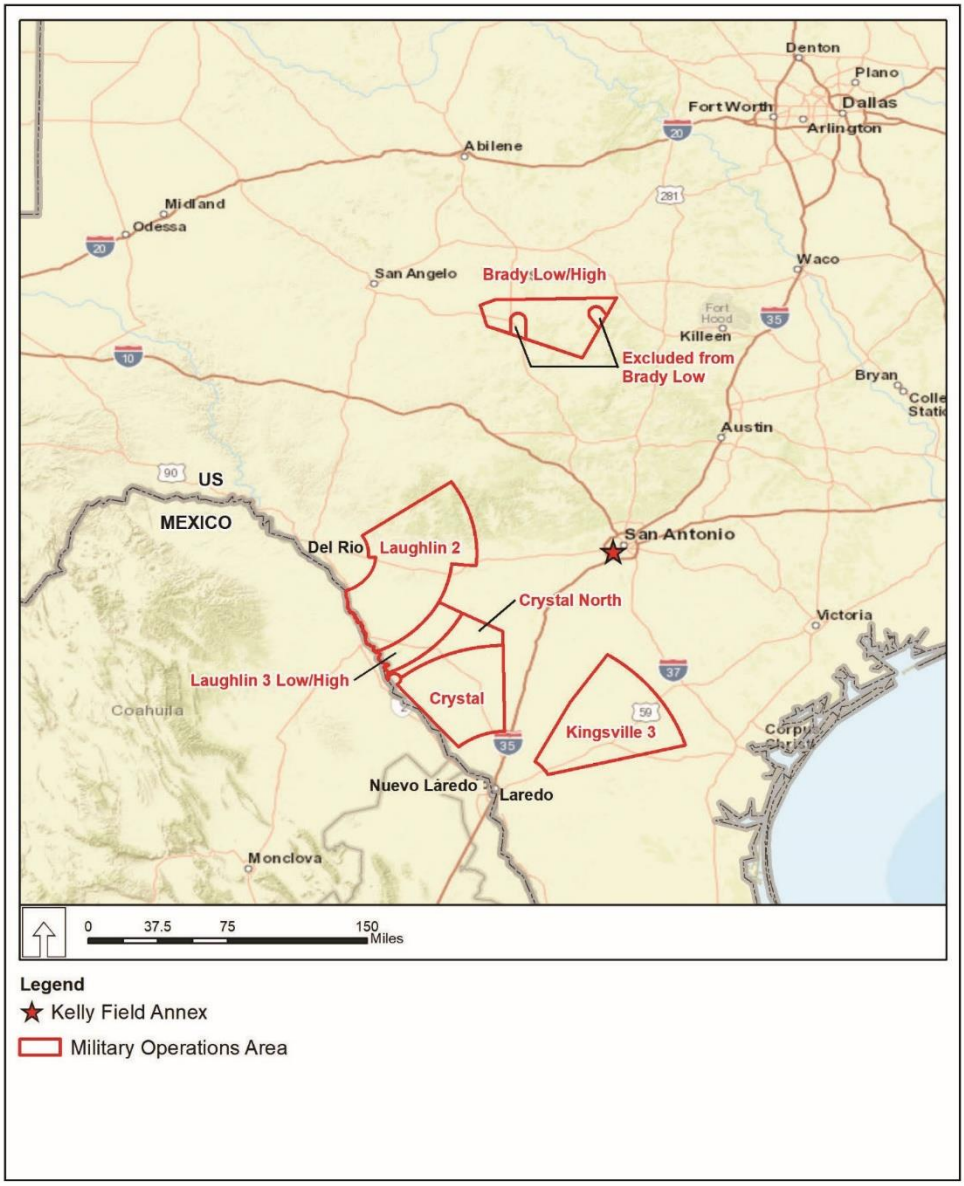


Figure 4. Military Operations Areas Proposed for Contract Adversary Air Sorties

Table 3--1
National Register of Historic Places Listed Resources Under the Airspace[1]

Military Operating Area	Resource	Type	Reference Number
Brady High	McCulloch County Courthouse	Building	77001515
Brady High	Old McCulloch County Jail	Building	75002073
Brady High	San Saba County Courthouse	Building	03000328
Crystal	Dimmit County Courthouse	Building	84001652
Crystal	Richardson, Asher and Mary Isabelle, House	Building	88002539
Crystal	Valenzuela Ranch Headquarters	District	85001562
Laughlin 2	1911 Kinney County Courthouse	Building	04000230
Laughlin 2	Maverick County Courthouse	Building	80004141
Laughlin 2	State Highway 3 Bridge at the Nueces River	Structure	96001108

Note:
[1] The condition is defined as "likely but not guaranteed to be extant" (or not guaranteed to be standing).

This page intentionally left blank

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
Guerra Library
7978 W. Military Drive
San Antonio TX 78227

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:36:47 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
Robert J. Kleberg Public Library
220 North 4th Street
Kingsville TX 78363

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:36:01 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
Las Palmas Library
515 Castroville Road
San Antonio TX 78237

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:35:17 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
Pan American Library
1122 W. Pyron Avenue
San Antonio TX 78221

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:34:31 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
F. M. Richards Memorial Library
1106 S. Blackburn Street
Brady TX 76825

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:33:45 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
San Antonio Public Library - Bazan
2200 W. Commerce Street
San Antonio TX 78201

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2019.01.15 10:33:00 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
San Antonio Central Library
600 Soledad Street
San Antonio TX 78205

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:30:11 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
Collins Garden Library
200 N. Park Boulevard
San Antonio TX 78204

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:32:13 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

Director
Val Verde County Library
300 Spring Street
Del Rio TX 78840

Dear Sir or Madam

Please find enclosed a copy of the Draft Environmental Assessment evaluating the potential environmental impacts associated with the proposed Combat Air Forces contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex TX. In accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations, the Air Force Engineer Center and JBSA-Lackland request that libraries file this document for public access and reference. Please maintain this document for public access, from 27 January 2019 to 26 February 2019. Written responses may be sent to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.15 10:28:48 -06'00'

EDWARD L. ROBERSON, P.E.

Enclosure:
1. Draft EA document

This page intentionally left blank

Appendix A-3

Draft Environmental Assessment Notices of Availability

This page intentionally left blank

Caller Times
PART OF THE USA TODAY NETWORK

Certificate of
Publication

In Matter of Publication of:

VERNADERO GROUP
3400 S. Carrollton Ave

NEW ORLEANS, LA 70185

State of Wisconsin)
))§
County of Brown)

I, being first duly sworn, upon oath depose and say that I am a legal clerk and employee of the publisher, namely, the Corpus Christi Caller-Times, a daily newspaper published at Corpus Christi in said City and State, generally circulated in Aransas, Bee, Brooks, Duval, Jim Wells, Kleberg, Live Oak, Nueces, Refugio, and San Patricio, Counties, and that the publication of which the annexed is a true copy, was inserted in the Corpus Christi Caller-Times on the following dates:

January 27, 2019

Kevin Yang
Legal Clerk

On this January 28, 2019, I certify that the attached document is a true and exact copy made by publisher.

Kazoua Yang 11/9/22
Notary Public, State of Wisconsin, County of Brown

KAZOUA YANG
NOTARY
PUBLIC
STATE OF WISCONSIN

Ad#: 2211640
P.O.:
# of Affidavits: 0

NOTICE OF AVAILABILITY

Draft Environmental Assessment for Combat Air Forces Adversary Air at Joint Base San Antonio – Lackland, Kelly Field Annex, Texas

A Draft Environmental Assessment (EA) and proposed Finding of No Significant Impact (FONSI) have been prepared by the U.S. Air Force to analyze the impacts of providing dedicated contract Adversary Air (ADAIR) sorties for Combat Air Forces training at Joint Base San Antonio – Lackland, Kelly Field Annex.

The Proposed Action includes the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven contractor aircraft to fly an estimated 1,200 annual sorties in special use airspace in support of the 149th Fighter Wing at Kelly Field Annex. Kelly Field Annex has existing facilities to support the Proposed Action that are available for use and require minimal modification. They are located around the existing airfield and runway and include the necessary ramp space; maintenance space; operational space; petroleum, oil, and lubricants storage; runway access; and associated parking to support the contract ADAIR mission.

The Draft EA and proposed FONSI are available at the following locations:

- San Antonio Central Library, 600 Soledad Street, San Antonio, Texas 78205
- San Antonio Public Library – Bazan, 2200 W. Commerce Street, San Antonio, Texas 78201
- Collins Garden Library, 200 N. Park Boulevard, San Antonio, Texas 78204
- Guerra Library, 7978 W. Military Drive, San Antonio, Texas 78227
- Las Palmas Library, 515 Castroville Road, San Antonio, Texas 78237
- Pan American Library, 1122 W. Pyron Avenue, San Antonio, Texas 78221
- F. M. Richards Memorial Library, 1106 S. Blackburn Street, Brady, Texas 76825
- Val Verde County Library, 300 Spring Street, Del Rio, Texas 78840
- Robert J. Kleberg Public Library, 220 North 4th Street, Kingsville, Texas 78363

An electronic copy of the Draft EA and proposed FONSI can also be found on the Joint Base San Antonio Website at http://www.jbsa.mil/information/Environmental/. Please provide any comments within 30 days of the date of this Notice of Availability. Comments should be mailed to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott Street, JBSA - Lackland, Texas 78236-5645 or by email at jock.flores@us.af.mil.

PRIVACY ADVISORY NOTICE

This Draft EA and proposed FONSI are provided for public comment in accordance with

THE STATE OF TEXAS **CASE/ PO NO.**
COUNTY OF VAL VERDE **BUSINESS: Vernadero Group Inc.**
AFFIDAVIT

Before me, the undersigned authority, on this 30th day of January personally appeared to Sandra Castillo, known to me, who, duly sworn, on her oath, that she deposes and says that she is the Publisher of the **Del Rio News-Herald**, a newspaper of general circulation published in said county; that the newspaper has been continuously and regularly published in said county for a period of more than one year; that a copy of the within and foregoing notice was published in said newspaper at least once a week for a period of one(1) time(s) before the return day names herein, such publication being on the following date(s):

1. January 27, 2019

S Castillo
Publisher or Publisher's
Authorized Representative

SWORN TO AND SUBSCRIBED BEFORE ME by Maddie Trevino
on this 30th day of January 2019

Josie Garcia
Notary Public, In and for
the State of Texas

JOSIE GARCIA
My Notary ID # 126387364
Expires February 16, 2020

0030 Public Notices 0030 Public Notices 0030 Public Notices 0030 Public Notices 0030 Publi

NOTICE OF AVAILABILITY

Draft Environmental Assessment for Combat Air Forces Adversary Air at Jo Base San Antonio– Lackland, Kelly Field Annex, Texas

A Draft Environmental Assessment (EA) and proposed Finding of No Significant Impact (FONSI) have been prepared by the U.S. Air Force to analyze the impacts of providing dedicated contract Adversary Air (ADAIR) sorties for Combat Air Forc training at Joint Base San Antonio – Lackland, Kelly Field Annex.

The Proposed Action includes the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven contr aircraft to fly an estimated 1,200 annual sorties in special use airspace in suppor the 149th Fighter Wing at Kelly Field Annex. Kelly Field Annex has existing faciliti to support the Proposed Action that are available for use and require minimal modification. They are located around the existing airfield and runway and includ necessary ramp space; maintenance space; operational space; petroleum, oil, ar lubricants storage; runway access; and associated parking to support the contrac ADAIR mission.

The Draft EA and proposed FONSI are available at the following locations:

- San Antonio Central Library, 600 Soledad Street, San Antonio, Texas 78205
- San Antonio Public Library – Bazan, 2200 W. Commerce Street, San Antonio, T 78201
- Collins Garden Library, 200 N. Park Boulevard, San Antonio, Texas 78204
- Guerra Library, 7978 W. Military Drive, San Antonio, Texas 78227
- Las Palmas Library, 515 Castroville Road, San Antonio, Texas 78237
- Pan American Library, 1122 W. Pyron Avenue, San Antonio, Texas 78221
- F. M. Richards Memorial Library, 1106 S. Blackburn Street, Brady, Texas 76825
- Val Verde County Library, 300 Spring Street, Del Rio, Texas 78840
- Robert J. Kleberg Public Library, 220 North 4th Street, Kingsville, Texas 78363

An electronic copy of the Draft EA and proposed FONSI can also be found on the Joint Base San Antonio Website at http://www.jbsa.mil/Information/Environmental Please provide any comments within 30 days of the date of this Notice of Availabi Comments should be mailed to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott Stre JBSA - Lackland, Texas 78236-5645 or by email at jock.flores@us.af.mil.

PRIVACY ADVISORY NOTICE

This Draft EA and proposed FONSI are provided for public comment in accordan with the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality NEPA Regulations (40 CFR §§1500-1508), and 32 CFR §§ Environmental Impact Analysis Process (EIAP). The EIAP provides an opportunity for public input on Air Force decision-making, allows the public to offer inputs on alternative ways for the Air Force to accomplish what it is proposing, and solicits comments on the Air Force's analysis of environmental effects.

Public commenting allows the Air Force to make better, informed decisions. Letter other written or oral comments provided may be published in the EA. As required law, comments provided will be addressed in the EA and made available to the pu Providing personal information is voluntary. Any personal information provided wil be used only to identify your desire to make a statement during the public comme portion of any public meetings or hearings or to fulfill requests for copies of the EA associated documents. Private addresses will be compiled to develop a mailing li for those requesting copies of EA; however, only the names of the individuals mal comments and specific comments will be disclosed. Personal home addresses ar phone numbers will not be published in the EA.

HEARST

MEDIA SOLUTIONS

San Antonio Express-News | ExpressNews.com | mySA.com

SAN ANTONIO EXPRESS NEWS
AFFIDAVIT OF PUBLICATION

STATE OF TEXAS:
COUNTY OF BEXAR

Before me, the undersigned authority, a Notary Public in and for the State of Texas, on this day personally appeared: Lynette Nelson, who after being duly sworn, says that she is the BOOKKEEPER of HEARST NEWSPAPERS, LLC - dba: SAN ANTONIO EXPRESS-NEWS, a daily newspaper published in Bexar County, Texas and that the publication, of which the annexed is a true copy, was published to wit:

Customer ID: 861816
Customer Name: Vernadero Group Inc.
Order ID: 3005092

Publication	Pub Date
EN Classified	27-JAN-19

Lynette Nelson
Bookkeeper

Sworn and subscribed to before me, this 29 **day of** Jan. **A.D.** 2019

Notary public in and for the State of Texas

MONIQUE EGAN
Notary Public, State of Texas
Comm. Expires 06-03-2020
Notary ID 3183735

NOTICE OF AVAILABILITY

Draft Environmental Assessment for Combat Air Forces Adversary Air at Joint Base San Antonio - Lackland, Kelly Field Annex, Texas

A Draft Environmental Assessment (EA) and proposed Finding of No Significant Impact (FONSI) have been prepared by the U.S. Air Force to analyze the impacts of providing dedicated contract Adversary Air (ADAIR) sorties for Combat Air Forces training at Joint Base San Antonio - Lackland, Kelly Field Annex.

The Proposed Action includes the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven contractor aircraft to fly an estimated 1,200 annual sorties in special use airspace in support of the 149th Fighter Wing at Kelly Field Annex. Kelly Field Annex has existing facilities to support the Proposed Action that are available for use and require minimal modification. They are located around the existing airfield and runway and include the necessary ramp space; maintenance space; operational space; petroleum, oil, and lubricants storage; runway access; and associated parking to support the contract ADAIR mission.

The Draft EA and proposed FONSI are available at the following locations:

- San Antonio Central Library, 600 Soledad Street, San Antonio, Texas 78205
- San Antonio Public Library - Bazan, 2200 W. Commerce Street, San Antonio, Texas 78201
- Collins Garden Library, 200 N. Park Boulevard, San Antonio, Texas 78204
- Guerra Library, 7978 W. Military Drive, San Antonio, Texas 78227
- Las Palmas Library, 515 Castroville Road, San Antonio, Texas 78237
- Pan American Library, 1122 W. Pyron Avenue, San Antonio, Texas 78221
- F. M. Richards Memorial Library, 1106 S. Blackburn Street, Brady, Texas 76825
- Val Verde County Library, 300 Spring Street, Del Rio, Texas 78840
- Robert J. Kleberg Public Library, 220 North 4th Street, Kingsville, Texas 78363

An electronic copy of the Draft EA and proposed FONSI can also be found on the Joint Base San Antonio Website at http://www.jbsa.mil/Information/Environmental/. Please provide any comments within 30 days of the date of this Notice of Availability. Comments should be mailed to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott Street, JBSA - Lackland, Texas 78236-5645 or by email at jock.flores@us.af.mil.

PRIVACY ADVISORY NOTICE

This Draft EA and proposed FONSI are provided for public comment in accordance with the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality NEPA Regulations (40 CFR §§1500-1508), and 32 CFR §989, Environmental Impact Analysis Process (EIAP). The EIAP provides an opportunity for public input on Air Force decision-making, allows the public to offer inputs on alternative ways for the Air Force to accomplish what it is proposing, and solicits comments on the Air Force's analysis of environmental effects.

Public commenting allows the Air Force to make better, informed decisions. Letters or other written or oral comments provided may be published in the EA. As required by law, comments provided will be addressed in the EA and made available to the public. Providing personal information is voluntary. Any personal information provided will be used only to identify your desire to make a statement during the public comment portion of any public meetings or hearings or to fulfill requests for copies of the EA or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of EA; however, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the EA.

Appendix A-4

Agency and Government-to-Government Comment Letters

This page intentionally left blank

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 10, 2018

Mr. Jock Flores
502 CES/CEIEA
1555 Gott St.
JBSA Lackland, Texas 78236-5645

Via: E-Mail

Re: TCEQ NEPA Request #2018-265, DOPAA Summary for Kelly Field Annex Combat Air Force Adversary Air; San Antonio, Texas, Bexar County

Dear Mr. Flores:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced project and offers the following comments:

The proposed action is located in Bexar County, which is designated nonattainment for the ozone National Ambient Air Quality Standards (NAAQS) with a classification of marginal, effective September 24, 2018. General Conformity regulations under 40 CFR Part 93 apply one year after designation, or on September 24, 2019 for Bexar County. Actions that commence before that date do not have to meet the new conformity requirements. However, actions that commence on or after that date will have to meet the requirements for the area's new designation.

Volatile organic compounds (VOC) and nitrogen oxides (NOX) are precursor pollutants that lead to the formation of ozone. Once applicable, a general conformity demonstration may be required when the total projected direct and indirect VOC or NOX emissions from an applicable action are equal to or exceed the de minimis emissions level, which is 100 tons per year for ozone NAAQS marginal nonattainment areas.

The Office of Water has no comment on this project.

Any debris or waste disposal should be at an appropriately authorized disposal facility.

Thank you for the opportunity to review this project. If you have any questions, please contact the agency NEPA Coordinator, at [redacted] or [redacted].

Sincerely,

Ryan Vise
Division Director
Intergovernmental Relations

Subject: RE: TPWD Review (#40776) Proposed Combat Air Forces contract Adversary Air (ADAIR) Support at JBSA-Kelly Field Annex, Bexar County

From: Russell Hooten [redacted]
Sent: Tuesday, October 16, 2018 1:16 PM
To: FLORES, JOCK GS-12 USAF AETC 502 CES/CENPL [redacted]
Cc: Russell Hooten [redacted]
Subject: [Non-DoD Source] TPWD Review (#40776) Proposed Combat Air Forces contract Adversary Air (ADAIR) Support at JBSA-Kelly Field Annex, Bexar County

Mr. Flores,

Texas Parks and Wildlife Department (TPWD) has received the request for comments regarding the development of an Environmental Assessment for the proposed action referenced in the Subject line above. Following a review of the documentation and project description provided, TPWD - Wildlife Habitat Assessment Program does not anticipate significant adverse impacts to rare, threatened, or endangered species, or other fish and wildlife resources. Provided the current project plans do not change, TPWD has no further comment and considers coordination to be complete. Please note it is the responsibility of the project proponent to comply with all federal, state, and local laws that protect fish and wildlife.

Sincerely,

Russell

Russell Hooten

Wildlife Habitat Assessment Program

TPWD-Wildlife Division

6300 Ocean Drive, NRC 2501

Unit 5846

Corpus Christi, TX 78412

[redacted]

[redacted] <mailto:[redacted]>

1

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

January 14, 2019

Mr. Edward L. Roberson, P.E.
Chief, Installation Management Flight
502 CES/CEI
1555 Gott Street
JBSA Lackland TX 78236-5645

RECEIVED
JAN 28 2019

Mr. Mark Wolfe
Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711

Dear Mr. Wolfe:

A couple of months ago, Mr. Edward Roberson (Deputy Civil Engineer, 802nd Civil Engineer Squadron) sent you a letter briefly describing the Air Force's proposal to establish an "Adversary Air" (ADAIR) operation at the Joint Base San Antonio (JBSA) Kelly Field Annex. I hope you or your staff have had the opportunity to review the summary of the Description of Proposed Action and Alternatives (DOPAA) that he provided. Now, per 36 CFR 800.11(e), I would like to provide documentation of our finding of *No Adverse Effect* and respectfully request your concurrence with this determination.

Under our Proposed Action, the Air Force would contract for 46 maintainers and 9 pilots to operate seven aircraft out of existing facilities at Kelly Field. These pilots would fly an estimated 1,200 sorties annually to provide a simulated enemy opponent during training provided by the 149th Fighter Wing located at Kelly Field. The training will take place in airspace near Kelly Field in Military Operations Areas (MOAs) which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. Most flying will take place in the Crystal, Crystal North, Laughlin 2, and Laughlin 3 MOAs located approximately 75 miles southwest of Kelly Field. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field and the Brady High and Low MOAs located approximately 110 miles north-northwest of Kelly Field. ADAIR pilots would use chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during all training, except in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions.

The U.S. Air Force (Air Force) has prepared a Draft Environmental Assessment (EA) to evaluate the potential environmental impacts associated with the proposed Combat Air Force contract Adversary Air (ADAIR) support at Joint Base San Antonio (JBSA)-Lackland, Kelly Field

Annex TX. The Draft EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations implementing NEPA, and the Air Force NEPA regulations.

Aircraft servicing will be performed at Kelly Field in Hangars 1610 and 1612 and Building 917. Hangars 1610 and 1612 were built in 1940 and 1942, respectively, at Kelly Field during the massive buildup of US Army Air Corps airfields prior to American entry into World War II. Hangar 1610 is a utilitarian structure of multilevel, vaulted construction featuring a two-way box truss system incorporating eight aircraft bays. The hangar has a steel framework with corrugated metal siding. A two-story office block runs the length of the east façade. The hangar's character defining features include elements of the Art Moderne (molded stucco banding) and International (industrial metal windows) architectural styles. Hangar 1610 was determined eligible for inclusion in the NRHP in 2003 under Criteria A and C as a contributing element of the Kelly Field Historic District (NR# 03000626; listed on the NRHP in July 2003 [KOMATSU/Rangel, Inc. et al., 1997; Geo-Marine, Inc., 2000]).

Hangar 1612 was constructed in 1942 as an Operations Hangar and Fire and Crash Truck Station. In 1986, the hangar was severely damaged in a fire, resulting in extensive renovations and alterations to the structure. As a result, the hangar suffered a loss of integrity; therefore, Hangar 1612 has been determined not eligible for inclusion in the NRHP with SHPO concurrence.

Building 917 was constructed in 2002; therefore, it is not considered a historic building.

Kelly Field Annex has three alternatives for providing proposed operations facilities which include operations and aircraft maintenance functions. Under Alternative 1, both Operations and Maintenance office and hangar space would be consolidated in Hangar 1612 with aircrew briefings in Building 917. Alternative 2 is similar to Option 1, but Operations and Maintenance would instead be consolidated in Hangar 1610 with aircrew briefings occurring in Building 917. Under Alternative 3, Operations would be integrated with the 182d Fighter Squadron in Building 917, and maintenance space would be located in Hangar 1610. Under all three alternatives, aircraft would be parked on the East Ramp near Hangars 1610 and 1612. Hangars 1610 and 1612 are owned by Port San Antonio and leased by the Air Force.

No exterior modifications or interior renovations to any facilities or ground-disturbing activities are proposed at Kelly Field Annex. Potential interior modifications would be very minor (i.e., carpet, paint) and the defining characteristics of the building, namely the exterior facades displaying aspects of the Art Moderne and International architectural styles, would not be impacted.

Under the Proposed Action, training activities utilize special use airspace proximate to Kelly Field Annex. Special use airspace includes Military Operations Areas (MOAs), which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. The primary operational airspace that would be used by contract ADAIR aircraft includes the Crystal and Laughlin MOAs located approximately 75 miles southwest of Kelly Field Annex. Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA

located approximately 80 miles south-southeast of Kelly Field Annex and the Brady MOAs located approximately 110 miles north-northwest of Kelly Field Annex.

There are nine historic resources associated with the MOAs listed in the NRHP, including one structure (a bridge), one district (a ranch and headquarters), and seven structures (one home, one jail, and five courthouses) (Table 3-23) (NPS, n.d.). No airspace modifications would be required for contract ADAIR as part of the Proposed Action and sorties within the MOAs would be performed at an altitude that would not affect historic resources.

The Air Force therefore requests written concurrence with its finding of *No Adverse Effect* regarding the Proposed Action at Kelly Field Annex. To ensure the Air Force has sufficient time to consider your input in the preparation of the EA, and for compliance with Section 106 of the NHPA, please provide comments or requests for additional information within 30 days of receipt of this letter to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645 or by email to jock.flores@us.af.mil. I have designated Mr. Flores as my principle point of contact on this effort. Thank you in advance for your consideration.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636
Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636
Date: 2019.01.18 11:43:56 -06'00'

EDWARD L. ROBERSON, P.E.

Attachment
1. Draft EA

CONCUR
by _____
for Mark Wolfe
State Historic Preservation Officer
Date 2/7/2019

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, FORT WORTH DISTRICT
P. O. BOX 17300
FORT WORTH, TEXAS 76102-0300

February 27, 2019

Regulatory Division

SUBJECT: Project Number SWF-2018-00374, Kelly Field Annex Combat Air Force Adversary Air

Mr. Jock Flores
502 CES/CEIE
1555 Gott St.
JBSA Lackland, Texas 78236

Dear Mr. Flores:

This letter is in regard to information received September 24, 2018, concerning a proposal by the United States Air Force to modify existing facilities in support of training mission located near JBSA-Kelly Field Annex. This project has been assigned Project Number SWF-2018-00374. Please include this number in all future correspondence concerning this project.

Under Section 404 of the Clean Water Act the U.S. Army Corps of Engineers (USACE) regulates the discharge of dredged and fill material into waters of the United States, including wetlands. USACE responsibility under Section 10 of the Rivers and Harbors Act of 1899 is to regulate any work in, or affecting, navigable waters of the United States. Based on your description of the proposed work, and other information available to us, we have determined this project will not involve activities subject to the requirements of Section 404 or Section 10. Therefore, it will not require Department of the Army authorization pursuant to Section 404 or Section 10.

Thank you for your interest in our nation's water resources. If you have any questions concerning our regulatory program, please refer to our website at http://www.swf.usace.army.mil/Missions/Regulatory or contact Ms. Katie Roeder at the address above or telephone [redacted] and refer to your assigned project number.

Please help the regulatory program improve its service by completing the survey on the following website: http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey

Sincerely,

for Stephen L Brooks
Chief, Regulatory Division

From: Zerrenner, Adam <[redacted]
Sent: Wednesday, March 13, 2019 1:05 PM
To: DOSS, JOHN M GS-13 USAF AFMC AFCEC/CZN <[redacted]
Cc: Stumpf, Christa [USA - EMP] [redacted] Tanya Sommer [redacted]
Patrick Connor [redacted]
Subject: Re: [EXTERNAL] FW: [Non-DoD Source] JBSA/Kelly Air EA - FWS POC

Hello Mr. Doss,

Thanks for providing us with this information. As you know, we don't concur with no effect determinations. Since DOD has made this determination, your no effect decision makes it fine for you to proceed.

Regards,
Adam

On Wed, Mar 13, 2019 at 9:41 AM DOSS, JOHN M GS-13 USAF AFMC AFCEC/CZN [redacted] wrote:

Good morning Mr. Zerrenner,

The US Air Force and Air Combat Command initiated an Environmental Assessment to analyze the impacts of Contracted Combat Air Forces Adversary Air (CAF ADAIR) on the human environment at Joint Base San Antonio – Kelly Filed Annex. As part of this analysis, a Biological Evaluation was completed which lead to a "no effect" determination by the Air Force. A letter, attached, requesting concurrence with the "no effect" determination was sent to your office dated 14 January 2019.

As of now, the Air Force has not received a response to the request for concurrence. This email serves as a follow up to the 14 January 2019 letter to ensure that it was received by your office and that you have a chance to respond. Although a written response would be preferable for inclusion in the Final Environmental Assessment, an email response for our records would meet our needs.

John M. Doss
NEPA Division, AFCEC/CZN
[redacted]

ADDRESSES:
U.S. POST OFFICE DELIVERIES:
2261 HUGHES AVE STE 155
JBSA LACKLAND TX 78236-9853

FedEx and UPS DELIVERIES:
3515 S GENERAL McMULLEN STE 155
SAN ANTONIO TX 78226-2018

Caution: This message may contain competitive, sensitive or other non-public information not intended for disclosure outside official government channels. Do not disseminate this message without approval of the undersigned's office. If you receive this message in error, please notify the sender by reply e-mail and delete all copies of this message.

"It all comes down to livin' fast or dyin' slow....which way you gonna go!" - Robert Earl Keen

From: Hartsell, Leslie [redacted]
Sent: Tuesday, March 12, 2019 3:36 PM
To: DOSS, JOHN M GS-13 USAF AFMC AFCEC/CZN [redacted]
Subject: [Non-DoD Source] JBSA/Kelly Air EA - FWS POC

H John-

Adam Zerrenner
[redacted]
Field Supervisor
Austin Ecological Services Field Office

v/r,
Leslie

--
Leslie Hartsell
FWS Liaison to Air Force
Lackland Air Force Base
2261 Hughes Avenue, Suite #155
San Antonio, Texas 78236

[redacted]

FWS.GOV Facebook Twitter Flickr

APPENDIX B

NOISE

This page intentionally left blank

Appendix B-1

Sound, Noise, and Potential Effects

This page intentionally left blank

B.1 SOUND, NOISE, AND POTENTIAL EFFECTS

B.1.1 Introduction

This appendix discusses sound and noise and their potential effects on the human and natural environment. Section B.1.2 provides an overview of the basics of sound and noise. Section B.1.3 defines and describes the different metrics used to describe noise. The largest section, Section B.1.4, reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. Section B.1.5 contains the list of references cited. Appendix B-2 contains data used in the noise modeling process. A number of noise metrics are defined and described in this appendix. Some metrics are included for the sake of completeness when discussing each metric and to provide a comparison of cumulative noise metrics.

B.1.2 Basics of Sound

B.1.2.1 Sound Waves and Decibels

Sound consists of minute vibrations in the air that travel through the air and are sensed by the human ear. **Figure B-1** is a sketch of sound waves from a tuning fork. The waves move outward as a series of crests where the air is compressed and troughs where the air is expanded. The height of the crests and the depth of the troughs are the amplitude or sound pressure of the wave. The pressure determines its energy or intensity. The number of crests or troughs that pass a given point each second is called the frequency of the sound wave.

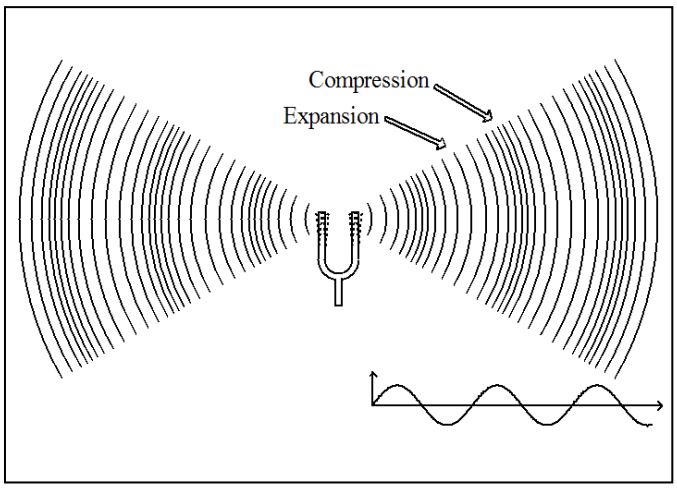


Figure B-1. Sound Waves from a Vibrating Tuning Fork.

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration.

- Intensity is a measure of the acoustic energy of the sound and is related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.
- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.
- Duration or the length of time the sound can be detected.

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

As shown on **Figure B-1**, the sound from a tuning fork spreads out uniformly as it travels from the source. The spreading causes the sound's intensity to decrease with increasing distance from the source. For a source such as an aircraft in flight, the sound level will decrease by about 6 dB for every doubling of the distance. For a busy highway, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from the source, it also is absorbed by the air. The amount of absorption depends on the frequency composition of the sound, the temperature, and the humidity conditions. Sound with high frequency content gets absorbed by the air more than sound with low frequency content. More sound is absorbed in colder and drier conditions than in hot and wet conditions. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover) and structures.

Because of the logarithmic nature of the decibel unit, sound levels cannot simply be added or subtracted and are somewhat cumbersome to handle mathematically; however, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB, and
80 dB + 80 dB = 83 dB.

Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

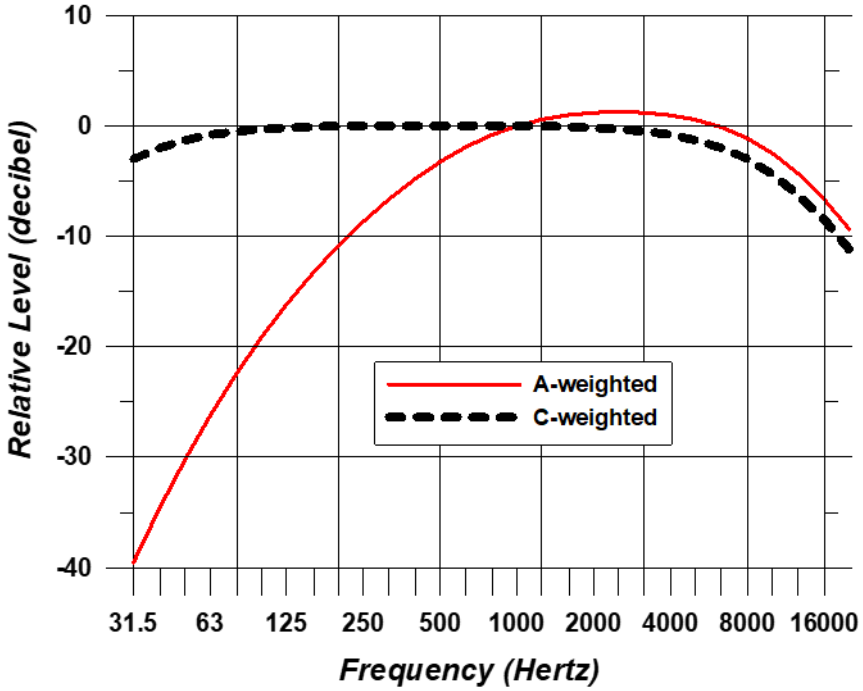
The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness. This relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because the human ear does not respond linearly.

Sound frequency is measured in terms of cycles per second or hertz (Hz). The normal ear of a young person can detect sounds that range in frequency from about 20 Hz to 20,000 Hz. As we get older, we lose the ability to hear high frequency sounds. Not all sounds in this wide range of frequencies are heard equally. Human hearing is most sensitive to frequencies in the 1,000 to 4,000 Hz range. The notes on a piano range from just over 27 Hz to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simple pure tones like the tuning fork on **Figure B-1**, but contain a mix, or spectrum, of many frequencies.

Sounds with different spectra are perceived differently even if the sound levels are the same. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. These two curves, shown on **Figure B-2**, are adequate to quantify most environmental noises. A-weighting puts emphasis on the 1,000 to 4,000 Hz range where human hearing is most sensitive.

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt, and can cause secondary effects, such as shaking of a structure or rattling of windows. These types of sounds can add to

annoyance and are best measured by C-weighted sound levels, denoted dBC. C-weighting is nearly flat throughout the audible frequency range and includes low frequencies that may not be heard but cause shaking or rattling. C-weighting approximates the human ear's sensitivity to higher intensity sounds.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure B-2. Frequency Characteristics of A- and C-Weighting.

B.1.2.2 Sound Levels and Types of Sounds

Most environmental sounds are measured using A-weighting. They're called A-weighted sound levels, and sometimes use the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term "A-weighted" is often omitted and the unit dB is used. Unless otherwise stated, dB units refer to A weighted sound levels.

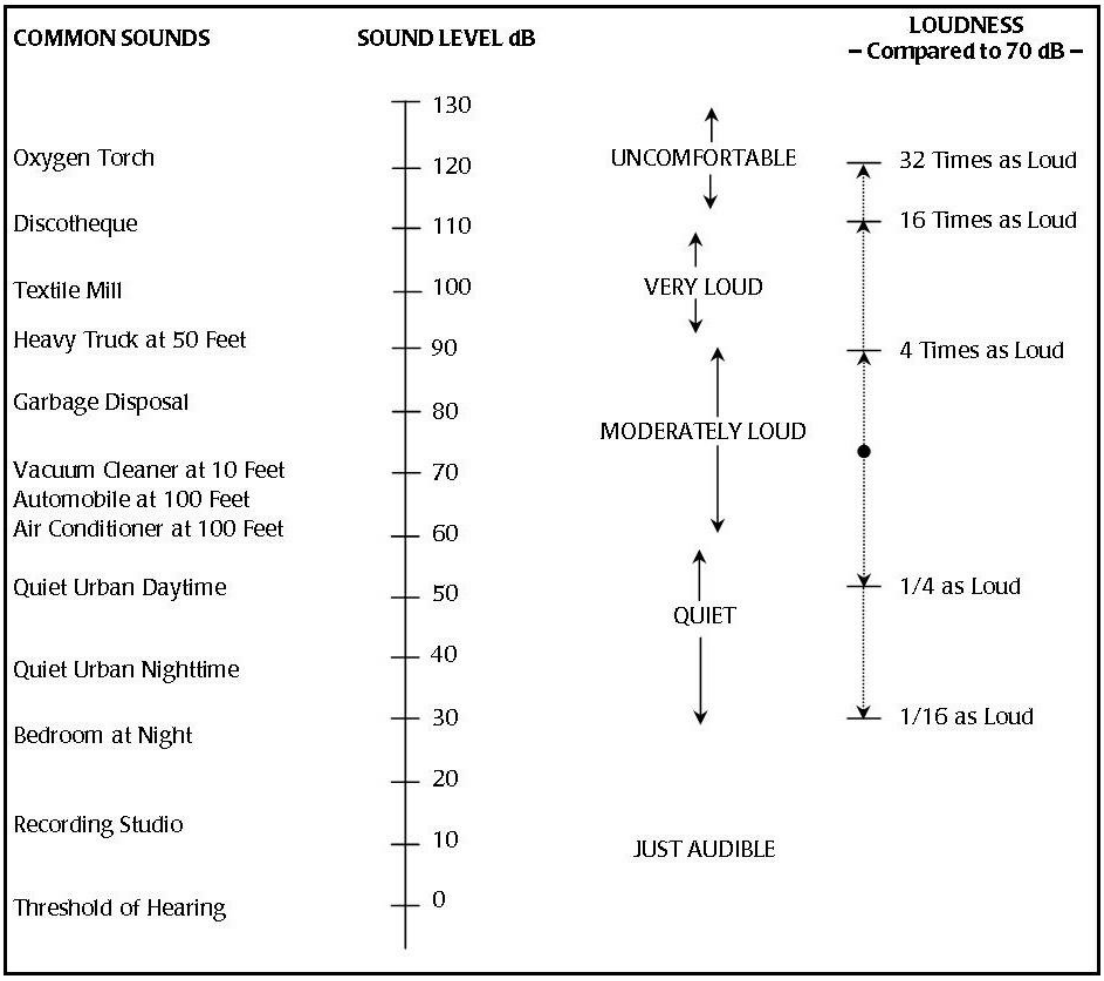
Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound. Noise can become an issue when its level exceeds the ambient or background sound level. Ambient noise in urban areas typically varies from 60 to 70 dB but can be as high as 80 dB in the center of a large city. Quiet suburban neighborhoods experience ambient noise levels around 45 to 50 dB (USEPA, 1978).

Figure B-3 shows A-weighted sound levels from common sources. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like "urban daytime" and "urban nighttime" are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods. These are discussed in detail in Section B.1.3.

Aircraft noise consists of two major types of sound events: flight (including takeoffs, landings and flyovers), and stationary, such as engine maintenance run-ups. The former is intermittent and the latter primarily

continuous. Noise from aircraft overflights typically occurs beneath main approach and departure paths, in local air traffic patterns around the airfield, and in areas near aircraft parking ramps and staging areas. As aircraft climb, the noise received on the ground drops to lower levels, eventually fading into the background or ambient levels.

Impulsive noises are generally short, loud events. Their single-event duration is usually less than 1 second. Examples of impulsive noises are small-arms gunfire, hammering, pile driving, metal impacts during rail-yard shunting operations, and riveting. Examples of high-energy impulsive sounds are quarry/mining explosions, sonic booms, demolition, and industrial processes that use high explosives, military ordnance (e.g., armor, artillery and mortar fire, and bombs), explosive ignition of rockets and missiles, and any other explosive source where the equivalent mass of dynamite exceeds 25 grams (American National Standards Institute [ANSI], 1996).



Source: Harris, 1979

Figure B-3. Typical A-weighted Sound Levels of Common Sounds.

B.1.3 Noise Metrics

Noise metrics quantify sounds so they can be compared with each other, and with their effects, in a standard way. There are a number of metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. This section describes the metrics relevant to environmental noise analysis.

B.1.3.1 Single Events

Maximum Sound Level (L_{max})

The highest A-weighted sound level measured during a single event in which the sound changes with time is called the maximum A-weighted sound level or Maximum Sound Level and is abbreviated L_{max}. The L_{max} is depicted for a sample event in **Figure B-4**.

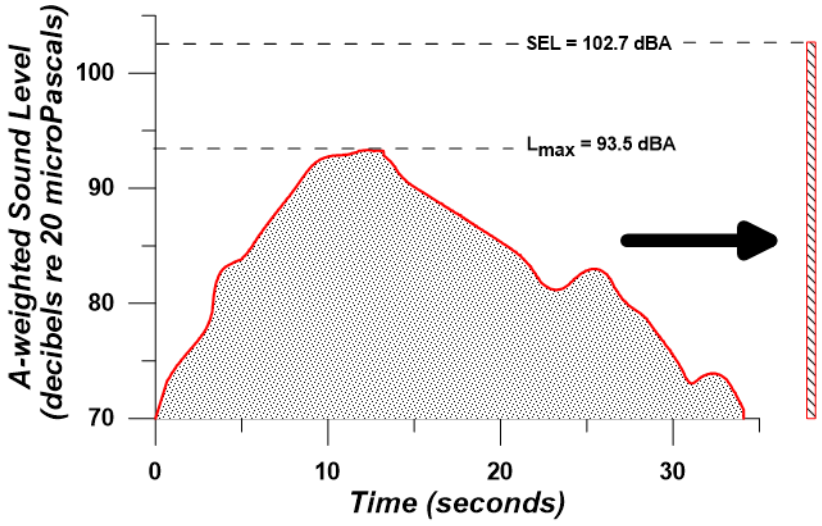
L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted as "slow" response. L_{max} is important in judging if a noise event will interfere with conversation, television or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise because it does not account for how long the sound is heard.

Peak Sound Pressure Level (L_{pk})

The Peak Sound Pressure Level is the highest instantaneous level measured by a sound level measurement meter. L_{pk} is typically measured every 20 microseconds, and usually based on unweighted or linear response of the meter. It is used to describe individual impulsive events such as blast noise. Because blast noise varies from shot to shot and varies with meteorological (weather) conditions, the US Department of Defense (DOD) usually characterizes L_{pk} by the metric PK 15(met), which is the L_{pk} exceeded 15 percent of the time. The "met" notation refers to the metric accounting for varied meteorological or weather conditions.

Sound Exposure Level (SEL)

Sound Exposure Level combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event. **Figure B-4** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.



Source: Wyle Laboratories

Figure B-4. Example Time History of Aircraft Noise Flyover.

Aircraft noise varies with time. During an aircraft overflight, noise starts at the background level, rises to a maximum level as the aircraft flies close to the observer, then returns to the background as the aircraft recedes into the distance. This is sketched on **Figure B-4**, which also indicates two metrics (L_{max} and SEL) that are described above. Over time there can be a number of events, not all the same. Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time, but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Overpressure

The single event metrics commonly used to assess supersonic noise are overpressure in psf and C-Weighted Sound Exposure Level (CSEL). Overpressure is the peak pressure at any location within the sonic boom footprint.

C-Weighted Sound Exposure Level

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (discussed in **Section B.1.2.2**) except that C-weighting places more emphasis on low frequencies below 1,000 hertz.

B.1.3.2 Cumulative Events

Equivalent Sound Level (L_{eq})

Equivalent Sound Level is a "cumulative" metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average SEL of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given time period.

The time period of an L_{eq} measurement is usually related to some activity, and is given along with the value. The time period is often shown in parenthesis (e.g., L_{eq}[24] for 24 hours). The L_{eq} from 7:00 a.m. to 3:00 p.m. may give exposure of noise for a school day.

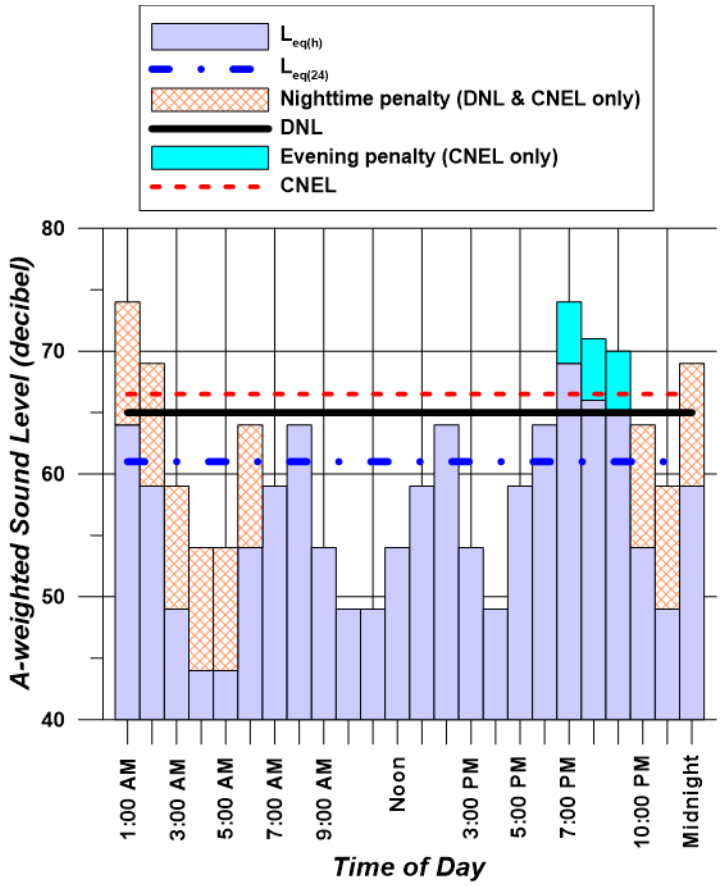
Figure B-5 gives an example of $L_{eq}(24)$ using notional hourly average noise levels ($L_{eq}(h)$) for each hour of the day as an example. The $L_{eq}(24)$ for this example is 61 dB.

Day-Night Average Sound Level (DNL or L_{dn}) and Community Noise Equivalent Level (CNEL)

Day-Night Average Sound Level is a cumulative metric that accounts for all noise events in a 24-hour period. However, unlike $L_{eq}(24)$, DNL contains a nighttime noise penalty. To account for our increased sensitivity to noise at night, DNL applies a 10-dB penalty to events during the nighttime period, defined as 10:00 p.m. to 7:00 a.m. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent.

CNEL is a variation of DNL specified by law in California (California Code of Regulations Title 21, Public Works) (Wyle Laboratories, 1970). CNEL has the 10-dB nighttime penalty for events between 10:00 p.m. and 7:00 a.m. but also includes a 4.8-dB penalty for events during the evening period of 7:00 p.m. to 10:00 p.m. The evening penalty in CNEL accounts for the added intrusiveness of sounds during that period. For airports and military airfields, DNL and CNEL represent the average sound level for annual average daily aircraft events.

Figure B-5 gives an example of DNL and CNEL using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. Note the $L_{eq}(h)$ for the hours between 10:00 p.m. and 7:00 a.m. have a 10-dB penalty assigned. For CNEL the hours between 7p.m. and 10 p.m. have a 4.8-dB penalty assigned. The DNL for this example is 65 dB. The CNEL for this example is 66 dB.



Source: Wyle Laboratories

Figure B-5. Example of $L_{eq}(24)$, DNL and CNEL Computed from Hourly Equivalent Sound Levels.

Figure B-6 shows the ranges of DNL or CNEL that occur in various types of communities. Under a flight path at a major airport the DNL may exceed 80 dB, while rural areas may experience DNL less than 45 dB. The decibel summation nature of these metrics causes the noise levels of the loudest events to control the 24-hour average. As a simple example, consider a case in which only one aircraft overflight occurs during the daytime over a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.9 dB. Assume, as a second example that 10 such 30-second overflights occur during daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.5 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events.

A feature of the DNL metric is that a given DNL value could result from a very few noisy events or a large number of quieter events. For example, one overflight at 90 dB creates the same DNL as 10 overflights at 80 dB.

DNL or CNEL does not represent a level heard at any given time but represent long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz, 1978; USEPA, 1978).

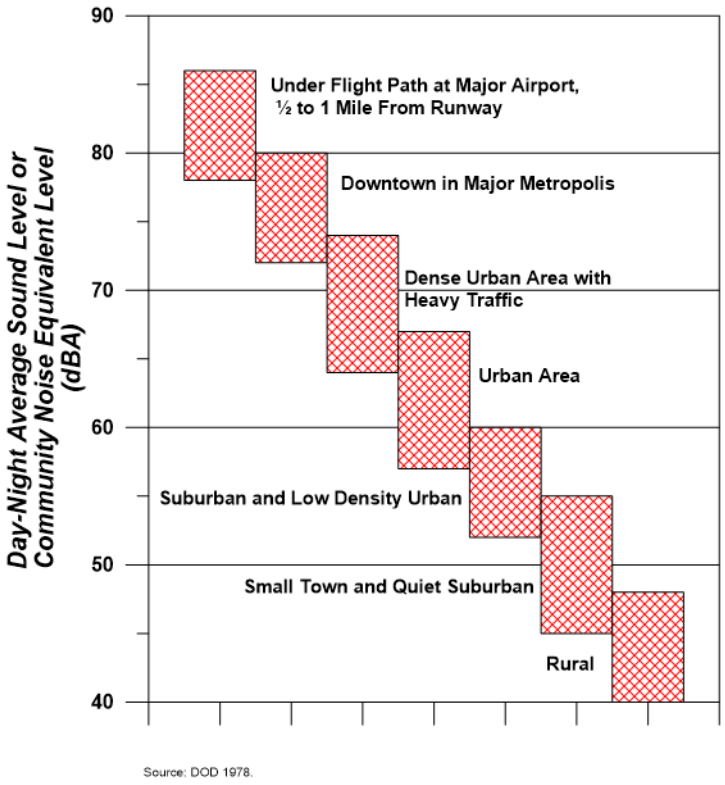


Figure B-6. Typical DNL or CNEL Ranges in Various Types of Communities.

Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) and Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$)

Military aircraft utilizing Special Use Airspace (SUA) such as Military Training Routes (MTRs), Military Operations Areas (MOAs), and Restricted Areas/Ranges generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in SUAs is highly sporadic. It is often seasonal, ranging from 10 per hour to less than 1 per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, with rates of up to 150 dB per second.

The cumulative daily noise metric devised to account for the "surprise" effect of the sudden onset of aircraft noise events on humans and the sporadic nature of SUA activity is the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Onset rates between 15 and 150 dB per second require an adjustment of 0 to 11 dB to the event's SEL, while onset rates below 15 dB per second require no adjustment to the event's SEL (Stusnick et al., 1992). The term 'monthly' in L_{dnmr} refers to the noise assessment being conducted for the month with the most operations or sorties -- the so-called busiest month.

In California, a variant of the L_{dnmr} includes a penalty for evening operations (7:00 p.m. to 10:00 p.m.) and is denoted $CNEL_{mr}$.

B.1.3.3 Supplemental Metrics

Number-of-Events Above (NA) a Threshold Level (L)

The Number-of-Events Above (NA) metric gives the total number of events that exceed a noise level threshold (L) during a specified period of time. Combined with the selected threshold, the metric is denoted

NAL. The threshold can be either SEL or L_{max}, and it is important that this selection is shown in the nomenclature. When labeling a contour line or point of interest (POI), NAL is followed by the number of events in parentheses. For example, where 10 events exceed an SEL of 90 dB over a given period of time, the nomenclature would be NA90SEL(10). Similarly, for L_{max} it would be NA90L_{max}(10). The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA is a supplemental metric. It is not supported by the amount of science behind DNL/CNEL, but it is valuable in helping to describe noise to the community. A threshold level and metric are selected that best meet the need for each situation. An L_{max} threshold is normally selected to analyze speech interference, while an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

Time Above (TA) a Specified Level (L)

The Time Above (TA) metric is the total time, in minutes, that the A-weighted noise level is at or above a threshold. Combined with the threshold level (L), it is denoted TAL. TA can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data for that time.

TA is a supplemental metric, used to help understand noise exposure. It is useful for describing the noise environment in schools, particularly when assessing classroom or other noise sensitive areas for various scenarios. TA can be shown as contours on a map similar to the way DNL contours are drawn.

TA helps describe the noise exposure of an individual event or many events occurring over a given time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis, so the results show not only how many events occur, but also the total duration of those events above the threshold.

B.1.4 Noise Effects

Noise is of concern because of potential adverse effects. The following subsections describe how noise can affect communities and the environment, and how those effects are quantified. The specific topics discussed are

- annoyance;
- speech interference;
- sleep disturbance;
- noise effects on children; and
- noise effects on domestic animals and wildlife.

B.1.4.1 Annoyance

With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith et al. (1953) and Stevens et al. (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its “Levels Document” (USEPA, 1974) that reviewed the factors that affected communities. DNL (still known as Ldn at the time) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents.

Surveys in the early years had a range of designs and formats and needed some interpretation to find common ground. In 1978, Schultz showed that the common ground was the number of people "highly annoyed," defined as the upper 28 percent range of whatever response scale a survey used (Schultz, 1978). With that definition, he was able to show a remarkable consistency among the majority of the surveys for which data were available. **Figure B-7** shows the result of his study relating DNL to individual annoyance measured by percent highly annoyed (%HA).

Schultz's original synthesis included 161 data points. **Figure B-8** shows a comparison of the predicted response of the Schultz data set with an expanded set of 400 data points collected through 1989 (Finegold et al., 1994). The new form is the preferred form in the United States, endorsed by the Federal Interagency Committee on Aviation Noise (FICAN, 1997). Other forms have been proposed, such as that of Fidell and Silvati (2004) but have not gained widespread acceptance.

When the goodness of fit of the Schultz curve is examined, the correlation between groups of people is high, in the range of 85 to 90 percent; however, the correlation between individuals is much lower, at 50 percent or less. This is not surprising, given the personal differences between individuals. The surveys underlying the Schultz curve include results that show that annoyance to noise is also affected by nonacoustical factors. Newman and Beattie (1985) divided the nonacoustic factors into the emotional and physical variables shown in **Table B-1**.

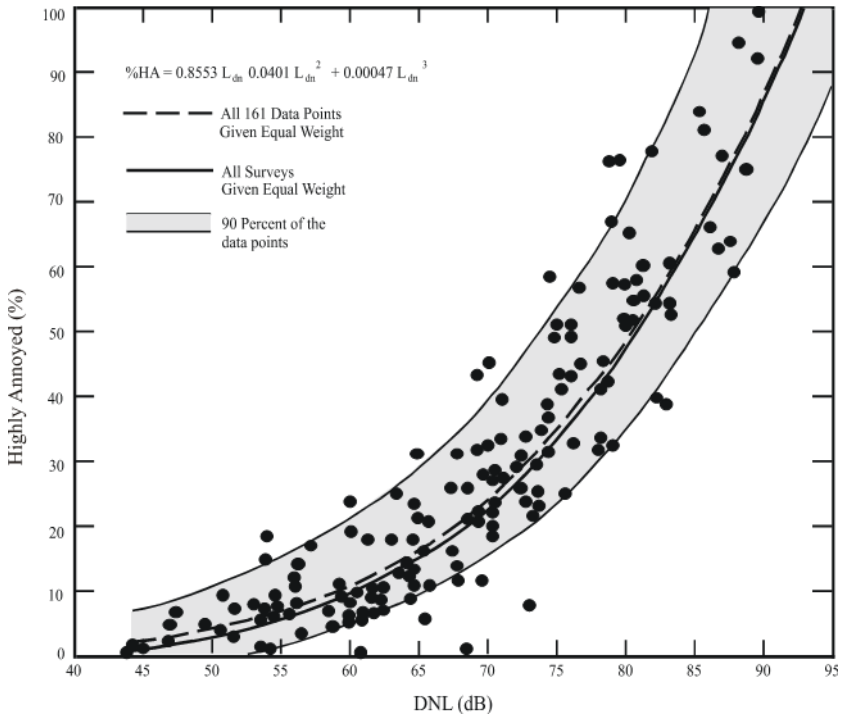


Figure B-7. Schultz Curve Relating Noise Annoyance to DNL (Schultz, 1978).

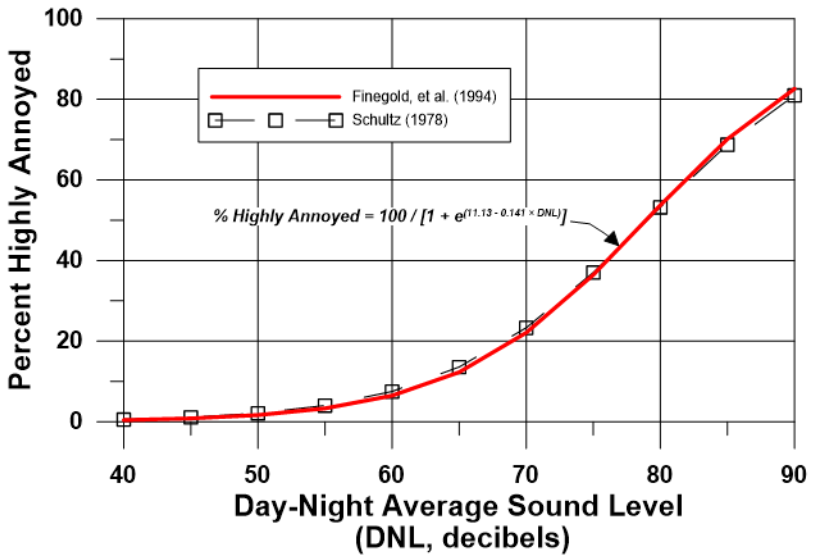


Figure B-8. Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al (1994).

Table B-1
Nonacoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables
Feeling about the necessity or preventability of the noise
Judgement of the importance and value of the activity that is producing the noise
Activity at the time an individual hears the noise
Attitude about the environment
General sensitivity to noise
Belief about the effect of noise on health
Feeling of fear associated with the noise

Physical Variables
Type of neighborhood
Time of day
Season
Predicitabiltiy of the noise
Control over the noise source
Length of time individual is exposed to a noise

Schreckenberg and Schuemer (2010) recently examined the importance of some of these factors on short term annoyance. Attitudinal factors were identified as having an effect on annoyance. In formal regression analysis, however, sound level (L_{eq}) was found to be more important than attitude. A series of studies at three European airports showed that less than 20 percent of the variance in annoyance can be explained by noise alone (Márki, 2013).

A recent study by Plotkin et al. (2011) examined updating DNL to account for these factors. It was concluded that the data requirements for a general analysis were much greater than are available from most existing studies. It was noted that the most significant issue with DNL is that it is not readily understood by the public, and that supplemental metrics such as TA and NA were valuable in addressing attitude when communicating noise analysis to communities (DOD, 2009a).

A factor that is partially nonacoustical is the source of the noise. Miedema and Vos (1998) presented synthesis curves for the relationship between DNL and percentage “Annoyed” and percentage “Highly Annoyed” for three transportation noise sources. Different curves were found for aircraft, road traffic, and railway noise. **Table B-2** summarizes their results. Comparing the updated Schultz curve suggests that the

percentage of people highly annoyed by aircraft noise may be higher than previously thought. Miedema and Oudshoorn (2001) authors supplemented that investigation with further derivation of percent of population highly annoyed as a function of either DNL or DENL along with the corresponding 95 percent confidence intervals with similar results.

Table B-2
Percent Highly Annoyed for Different Transportation Noise Sources

DNL (dB)	Percent Hightly Annoyed (%HA)			
	Miedema and Vos			Schultz Combined
	Air	Road	Rail	
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema and Vos, 1998

As noted by the World Health Organization (WHO), however, even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO, 1999).

Consistent with WHO's recommendations, the Federal Interagency Committee on Noise (FICON, 1992) considered the Schultz curve to be the best source of dose information to predict community response to noise but recommended further research to investigate the differences in perception of noise from different sources.

The International Standard (ISO 1996:1-2016) update introduced the concept of Community Tolerance Level (L_{ct}) as the day-night sound level at which 50 percent of the people in a particular community are predicted to be highly annoyed by noise exposure. L_{ct} accounts for differences between sources and/or communities when predicting the percentage highly annoyed by noise exposure. ISO also recommended a change to the adjustment range used when comparing aircraft noise to road noise. The previous edition suggested a +3 dB to +6 dB for aircraft noise relative to road noise while the latest editions recommends an adjustment range of +5 dB to +8 dB. This adjustment range allows DNL to be correlated to consistent annoyance rates when originating from different noise sources (i.e., road traffic, aircraft, or railroad). This change to the adjustment range would increase the calculated percent highly annoyed at 65 dB DNL by approximately 2 to 5 percent greater than the previous ISO definition. **Figure B-9** depicts the estimated percentage of people highly annoyed for a given DNL using both the ISO 1996-1 estimation and the older FICON 1992 method. The results suggest that the percentage of people highly annoyed may be greater than previous thought and reliance solely on DNL for impact analysis may be insufficient if utilizing the FICON 1992 method.

The US Federal Aviation Administration (FAA) is currently conducting a major airport community noise survey at approximately 20 US airports in order to update the relationship between aircraft noise and annoyance. Results from this study are expected to be released in 2018.

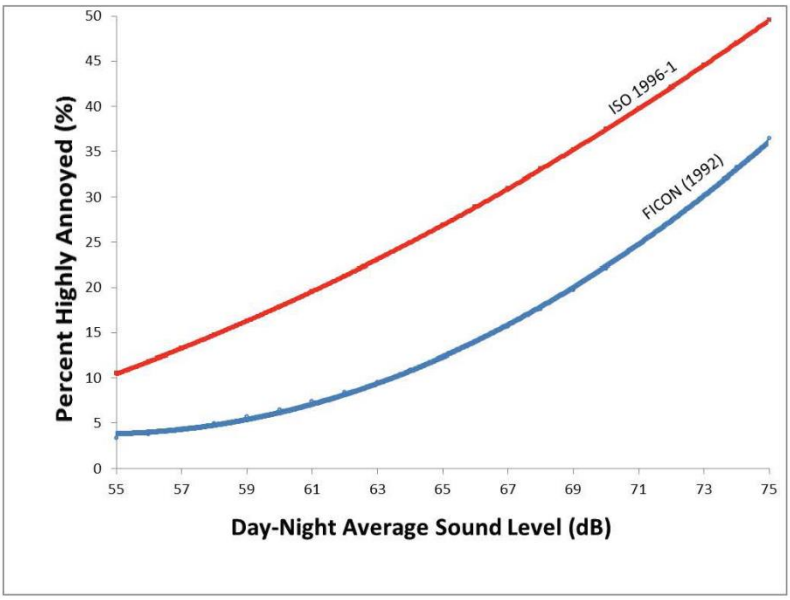


Figure B-9. Percent Highly Annoyed Comparison of ISO 1996-1 to FICON (1992).

B.1.4.2 Speech Interference

Speech interference from noise is a primary cause of annoyance for communities. Disruption of routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.
There are two measures of speech comprehension:

1. Word Intelligibility - the percent of words spoken and understood. This might be important for students in the lower grades who are learning the English language, and particularly for students who have English as a Second Language.
2. Sentence Intelligibility – the percent of sentences spoken and understood. This might be important for high-school students and adults who are familiar with the language, and who do not necessarily have to understand each word in order to understand sentences.

US Federal Criteria for Interior Noise

In 1974, the USEPA identified a goal of an indoor $L_{eq}(24)$ of 45 dB to minimize speech interference based on sentence intelligibility and the presence of steady noise (USEPA 1974). **Figure B-10** shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background indoor sound levels of less than 45 dB L_{eq} are expected to allow 100 percent sentence intelligibility.

The curve on **Figure B-10** shows 99 percent intelligibility at L_{eq} below 54 dB, and less than 10 percent above 73 dB. Recalling that L_{eq} is dominated by louder noise events, the USEPA $L_{eq}(24)$ goal of 45 dB generally ensures that sentence intelligibility will be high most of the time.

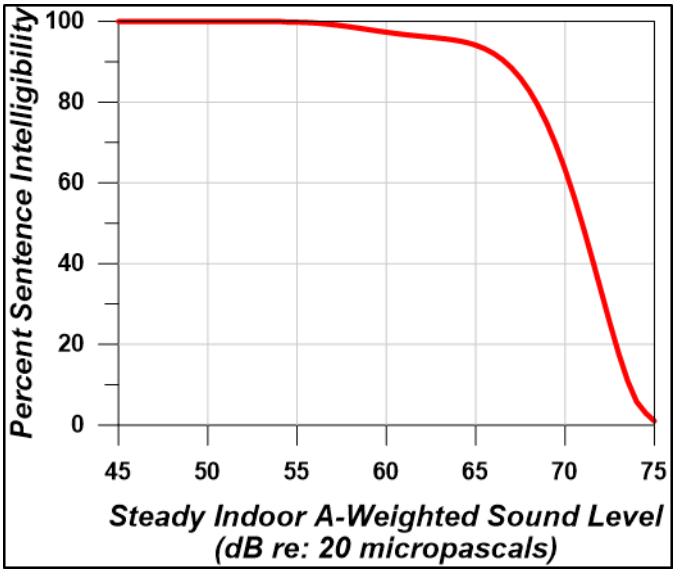


Figure B-10. Speech Intelligibility Curve (digitized from USEPA, 1974).

Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise has to be below the teacher's voice level. Intermittent noise events that momentarily drown out the teacher's voice need to be kept to a minimum. It is therefore important to evaluate the steady background level, the level of voice communication, and the single-event level due to aircraft overflights that might interfere with speech.

Lazarus (1990) found that for listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., a comparison of the level of the sound to the level of background noise) is in the range of 15 to 18 dB. The initial ANSI classroom noise standard (ANSI, 2002) and American Speech-Language-Hearing Association (ASLHA, 2005) guidelines concur, recommending at least a 15-dB signal-to-noise ratio in classrooms. If the teacher's voice level is at least 50 dB, the background noise level must not exceed an average of 35 dB. The National Research Council of Canada (Bradley, 1993) and WHO (1999) agree with this criterion for background noise.

For eligibility for noise insulation funding, the FAA guidelines state that the design objective for a classroom environment is 45 dB L_{eq} during normal school hours (FAA, 1985).

Most aircraft noise is not continuous. It consists of individual events like the one sketched on **Figure B-4**. Since speech interference in the presence of aircraft noise is caused by individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate. In addition to the background level criteria described above, single-event criteria that account for those noisy events are also needed.

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500-2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A weighted L_{max} of 50 dB for aircraft noise (Wesler, 1986).

Lind et al. (1998) also concluded that an L_{max} criterion of 50 dB would result in 90 percent word intelligibility. Bradley (1985) recommends SEL as a better indicator. His work indicates that 95 percent word intelligibility would be achieved when indoor SEL did not exceed 60 dB. For typical flyover noise, this corresponds to an L_{max} of 50 dB. While WHO (1999) only specifies a background L_{max} criterion, they also note the SIL frequencies and that interference can begin at around 50 dB.

The United Kingdom Department for Education and Skills (UKDfES) established in its classroom acoustics guide a 30-minute time-averaged metric of L_{eq}(30min) for background levels and the metric of LA1,30min for intermittent noises, at thresholds of 30 to 35 dB and 55 dB, respectively. LA1,30min represents the A-weighted sound level that is exceeded 1 percent of the time (in this case, during a 30-minute teaching session) and is generally equivalent to the L_{max} metric (UKDfES, 2003).

Table B-3 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, they are consistent with a limit on indoor background noise of 35 to 40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table B-3
Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
US FAA (1985)	$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.
Lind et al. (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / SIL 45	Single event level permissible in the classroom.
WHO (1999)	L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.
US ANSI (2010)	L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
UK DFES (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.

B.1.4.3 Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to aircraft noise at night. A number of studies have attempted to quantify the effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies. Emphasis is on studies that have influenced US federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on sleep observations performed under laboratory conditions.
2. Later studies performed in the 1990s up to the present, where the research was focused on field observations.

Initial Studies

The relation between noise and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep and the noise level, but also on the nonacoustic factors cited for annoyance. The easiest effect to measure is the number of arousals or awakenings from noise events.

Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

FICON's 1992 review of airport noise issues (FICON, 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn, 1978; Lukas, 1978; Pearsons et. al., 1989). Because of large variability in the data, FICON did not endorse the reliability of those results.

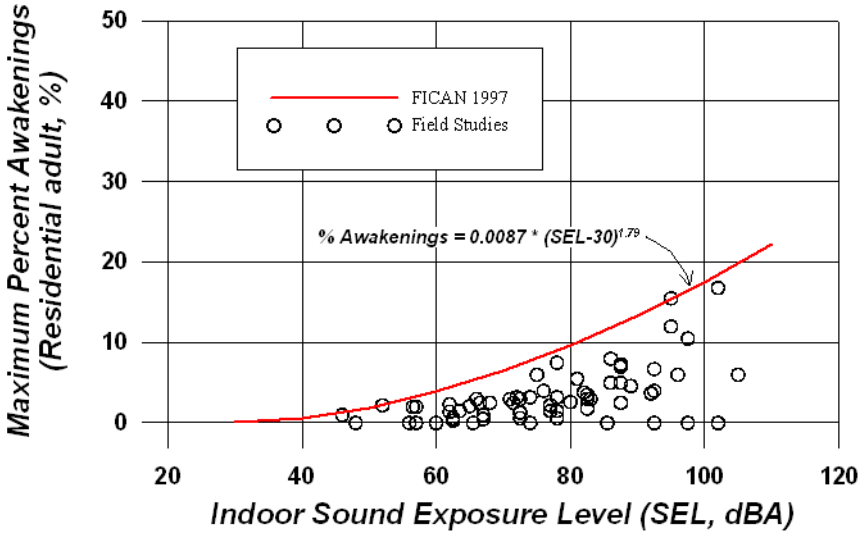
FICON did, however, recommend an interim dose-response curve, awaiting future research. That curve predicted the percent of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the US Air Force (Finegold, 1994). The data included most of the research performed up to that point and predicted a 10 percent probability of awakening when exposed to an interior SEL of 58 dB. The data used to derive this curve were primarily from controlled laboratory studies.

Recent Sleep Disturbance Research – Field and Laboratory Studies

It was noted that early sleep laboratory studies did not account for some important factors. These included habituation to the laboratory, previous exposure to noise, and awakenings from noise other than aircraft. In the early 1990s, field studies in people's homes were conducted to validate the earlier laboratory work conducted in the 1960s and 1970s. The field studies of the 1990s (e.g., Horne, 1994) found that 80-90 percent of sleep disturbances were not related to outdoor noise events, but rather to indoor noises and nonnoise factors. The results showed that, in real life conditions, there was less of an effect of noise on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies because people who sleep in their own homes are used to their environment and, therefore, do not wake up as easily (FICAN, 1997).

FICAN

Based on this new information, in 1997 FICAN recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN, 1997). **Figure B-11** shows FICAN's curve, the red line, which is based on the results of three field studies shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994; Fidell et al., 1995a, 1995b), along with the data from six previous field studies.



Source: FICAN 1997

Figure B-11. FICAN 1997 Recommended Sleep Disturbance Dose-Response Relationship.

The 1997 FICAN curve represents the upper envelope of the latest field data. It predicts the maximum percent awakened for a given residential population. According to this curve, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB. An indoor SEL of 58 dB is equivalent to an outdoor SEL of about 83 dB, with the windows closed (73 dB with windows open).

Number of Events and Awakenings

It is reasonable to expect that sleep disturbance is affected by the number of events. The German Aerospace Center (DLR Laboratory) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner, 2004). The DLR Laboratory study was one of the largest studies to examine the link between aircraft noise and sleep disturbance. It involved both laboratory and in-home field research phases. The DLR Laboratory investigators developed a dose-response curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

Later studies by DLR Laboratory conducted in the laboratory comparing the probability of awakenings from different modes of transportation showed that aircraft noise lead to significantly lower awakening probabilities than either road or rail noise (Basner et al., 2011). Furthermore, it was noted that the probability of awakening, per noise event, decreased as the number of noise events increased. The authors concluded that by far the majority of awakenings from noise events merely replaced awakenings that would have occurred spontaneously anyway.

A different approach was taken by an ANSI standards committee (ANSI, 2008). The committee used the average of the data shown on **Figure B-10** rather than the upper envelope, to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.

Currently, there are no established criteria for evaluating sleep disturbance from aircraft noise, although recent studies have suggested a benchmark of an outdoor SEL of 90 dB as an appropriate tentative criterion when comparing the effects of different operational alternatives. The corresponding indoor SEL would be approximately 25 dB lower (at 65 dB) with doors and windows closed, and approximately 15 dB lower (at 75 dB) with doors or windows open. According to the ANSI (2008) standard, the probability of awakening from a single aircraft event at this level is between 1 and 2 percent for people habituated to the noise sleeping in bedrooms with windows closed, and 2 to 3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at noise levels of 90 dB SEL is shown in **Table B-4**.

Table B-4
Probability of Awakening from NA90SEL

Number of Aircraft Events at 90 dB SEL for Average 9-Hour Night	Minimum Probability of Awakening at Least Once	
	Windows Closed	Windows Open
1	1%	2%
3	4%	6%
5	7%	10%
9 (1 per hour)	12%	18%
18 (2 per hour)	22%	33%
27 (3 per hour)	32%	45%

Source: DOD, 2009b

In December 2008, FICAN recommended the use of this new standard. FICAN also recognized that more research is underway by various organizations, and that work may result in changes to FICAN's position. Until that time, FICAN recommends the use of the ANSI (2008) standard (FICAN 2008).

Summary

Sleep disturbance research still lacks the details to accurately estimate the population awakened for a given noise exposure. The procedure described in the ANSI (2008) Standard and endorsed by FICAN is based on probability calculations that have not yet been scientifically validated. While this procedure certainly provides a much better method for evaluating sleep awakenings from multiple aircraft noise events, the estimated probability of awakenings can only be considered approximate.

B.1.4.4 Noise Effects on Children

Recent studies on school children indicate a potential link between aircraft noise and both reading comprehension and learning motivation. The effects may be small but may be of particular concern for children who are already scholastically challenged.

Effects on Learning and Cognitive Abilities

Early studies in several countries (Cohen et al., 1973, 1980, 1981; Bronzaft and McCarthy, 1975; Green et al., 1982; Evans et al., 1998; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies noise exposed children were less likely to solve difficult puzzles or more likely to give up.

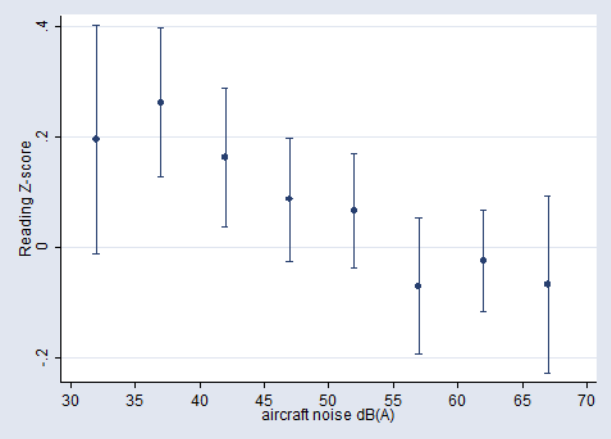
A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise ceases. Most convincing was the finding that deficits in memory and reading comprehension developed over the 2-year follow-up for children who became newly noise exposed near the new airport; deficits were also observed in speech perception for the newly noise-exposed children.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld et al., 2005; Clark et al., 2005) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better performance in high road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Stansfeld et al., 2005; Clark et al., 2006).

Figure B-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at Leq greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.

An observation of the RANCH study was that children may be exposed to aircraft noise for many of their childhood years and the consequences of long-term noise exposure were unknown. A follow-up study of the children in the RANCH project is being analyzed to examine the long-term effects on children's reading comprehension (Clark et al., 2009). Preliminary analysis indicated a trend for reading comprehension to be poorer at 15 to 16 years of age for children who attended noise-exposed primary schools. An additional study utilizing the same data set (Clark et al., 2012) investigated the effects of traffic-related air pollution and found little evidence that air pollution moderated the association of noise exposure on children's cognition.



Sources: Stansfeld et al. 2005; Clark et al. 2006

Figure B-12. RANCH Study Reading Scores Varying with L_{eq}.

There was also a trend for reading comprehension to be poorer in aircraft noise exposed secondary schools. Significant differences in reading scores were found between primary school children in the two different classrooms at the same school (Bronzaft and McCarthy, 1975). One classroom was exposed to high levels of railway noise while the other classroom was quiet. The mean reading age of the noise-exposed children was 3 to 4 months behind that of the control children. Studies suggest that the evidence of the effects of noise on children's cognition has grown stronger over recent years, (Stansfeld and Clark, 2015), but further analysis adjusting for confounding factors is ongoing, and is needed to confirm these initial conclusions.

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in noise. Children have lower stored phonological knowledge to reconstruct degraded speech reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al., 2013).

FICAN funded a pilot study to assess the relationship between aircraft noise reduction and standardized test scores (Eagan et al., 2004; FICAN, 2007). The study evaluated whether abrupt aircraft noise reduction within classrooms, from either airport closure or sound insulation, was associated with improvements in test scores. Data were collected in 35 public schools near three airports in Illinois and Texas. The study used several noise metrics. These were, however, all computed indoor levels, which makes it hard to compare with the outdoor levels used in most other studies.

The FICAN study found a significant association between noise reduction and a decrease in failure rates for high school students, but not middle or elementary school students. There were some weaker associations between noise reduction and an increase in failure rates for middle and elementary schools. Overall the study found that the associations observed were similar for children with or without learning difficulties, and between verbal and math/science tests. As a pilot study, it was not expected to obtain final answers but provided useful indications (FICAN, 2007).

A recent study of the effect of aircraft noise on student learning (Sharp et al., 2013) examined student test scores at a total of 6,198 US elementary schools, 917 of which were exposed to aircraft noise at 46 airports with noise exposures exceeding 55 dB DNL. The study found small but statistically significant associations between airport noise and student mathematics and reading test scores, after taking demographic and school factors into account. Associations were also observed for ambient noise and total noise on student mathematics and reading test scores, suggesting that noise levels per se, as well as from aircraft, might play a role in student achievement.

As part of the Noise-Related Annoyance, Cognition and Health (NORAH) study conducted at Frankfurt airport, reading tests were conducted on 1,209 school children at 29 primary schools. It was found that there was a small decrease in reading performance that corresponded to a one-month reading delay; however, a recent study observing children at 11 schools surrounding Los Angeles International Airport (LAX) found that the majority of distractions to elementary age students were other students followed by themselves, which includes playing with various items and daydreaming. Less than 1 percent of distractions were caused by traffic noise.

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO, 2000; WHO, 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI, 2002).

B.1.4.5 Noise Effects on Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, has not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci et al. (1988), assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intraspecific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system, and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci et al., 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights.

Secondary effects may include nonauditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects, and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles, 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects, and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith et al., 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci et al., 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith et al., 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci et al., 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau, 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service, 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock. This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci et al., 1988).

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The relationships between physiological effects and how species interact with their environments have not been thoroughly studied; therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

B.1.5 References

American Speech-Language-Hearing Association. 2005. *Guidelines for Addressing Acoustics in Educational Settings, ASHA Working Group on Classroom Acoustics*.

ANSI. 1985. *Specification for Sound Level Meters, ANSI S1.4A-1985 Amendment to ANSI S1.4-1983*.

ANSI. 1988. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 1, ANSI S12.9-1988*.

ANSI. 1996. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 4, ANSI S12.9-1996*.

ANSI. 2002. *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, ANSI S12.60-2002*.

ANSI. 2008. *Methods for Estimation of Awakenings with Outdoor Noise Events Heard in Homes, ANSI S12.9-2008/Part6*.

Austin, Jr., O.L., W.B. Robertson, Jr., and G.E. Wolfenden. 1970. *Mass Hatching Failure in Dry Tortugas Sooty Terns (Sterna fuscata)*. Proceedings of the XVth International Arnithological Congress, The Hague, The Netherlands, August 30 through September 5.

Basner, M., W. Babisch, A. Davis, M. Brink, C. Clark, S. Janssess, et al. 2014. *Auditory and non-auditory effects of noise on health*. The Lancet 383, Issue 9925, 1325 - 1332

Basner, M., H. Buess, U. Miller, G. Platt, and A. Samuel. 2004. *Aircraft Noise Effects on Sleep: Final Results of DLR Laboratory and Field Studies of 2240 Polysomnographically Recorded Subject Nights*. Internoise 2004, The 33rd International Congress and Exposition on Noise Control Engineering, August 22-25.

Basner M, U. Muller, and E.M. Elmenhorst. 2011. *Single and combined effects of air, road, and rail traffic noise on sleep and recuperation*. Sleep 2011; 34: 11–23.

Berglund, B., and T. Lindvall, eds. 1995. *Community Noise*. Jannes Snabbtryck, Stockholm, Sweden.

Bowles, A.E. 1995. *Responses of Wildlife to Noise*, In *Wildlife and Recreationists: Coexistence through Management and Research*, R.L. Knight and K.J. Gutzwiller, eds. Island Press, Covelo, California, pp. 109-156.

Bradley J.S. 1985. *Uniform Derivation of Optimum Conditions for Speech in Rooms*. National Research Council, Building Research Note, BRN 239, Ottawa, Canada.

Bradley, J.S. 1993. *NRC-CNRC NEF Validation Study: Review of Aircraft Noise and its Effects*. National Research Council Canada and Transport Canada, Contract Report A-1505.5.

Bronzaft, A.L., and D.P. McCarthy. 1975. *The effects of elevated train noise on reading ability*. J. Environment and Behavior 7, 517-527.

Clark, C., Crombie, R., Head, J., van Kamp, I., van Kempen, E., & Stansfeld, S. A. 2012. *Does Traffic-related Air Pollution Explain Associations of Aircraft and Road Traffic Noise Exposure on Children's Health and Cognition? A Secondary Analysis of the United Kingdom Sample from the RANCH Project*. American Journal of Epidemiology 176(4), 327–337

Clark, C., R. Martin, E. van Kempen, T. Alfred, J. Head, H.W. Davies, M.M. Haines, I.L. Barrio, M. Matheson, and S.A. Stansfeld. 2005. *Exposure-effect relations between aircraft and road traffic noise exposure at school and reading comprehension: the RANCH project*. American Journal of Epidemiology 163, 27-37.

Clark, C., S.A. Stansfeld, and J. Head. 2009. *The long-term effects of aircraft noise exposure on children's cognition: findings from the UK RANCH follow-up study*. In Proceedings of the Euronoise Conference. Edinburgh, Scotland, October.

Cohen, S., D.C. Glass, and J.E. Singer. 1973. *Apartment noise, auditory discrimination, and reading ability in children*. Journal of Experimental Social Psychology 9, 407-422.

Cohen, S., G.W. Evans, D.S. Krantz, et al. 1980. *Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from Laboratory to Field*. American Psychologist 35, pp. 231-243.

Cohen, S., G.W. Evans, D.S. Krantz, et al. 1981. *Aircraft noise and children: longitudinal and cross-sectional evidence on adaptation to noise and the effectiveness of noise abatement.* Journal of Personality and Social Psychology 40, 331-345.

Cottereau, P. 1978. *The Effect of Sonic Boom from Aircraft on Wildlife and Animal Husbandry*, In *Effects of Noise on Wildlife*, Academic Press, New York, New York, pp. 63-79.

DOD. 2009a. *Improving Aviation Noise Planning, Analysis, and Public Communication with Supplemental Metrics*. Defense Noise Working Group Technical Bulletin, December.

DOD. 2009b. *Sleep Disturbance from Aviation Noise*. Defense Noise Working Group Technical Bulletin, November.

Eagan, M.E., G. Anderson, B. Nicholas, R. Horonjeff, and T. Tivnan. 2004. *Relation Between Aircraft Noise Reduction in Schools and Standardized Test Scores*. Washington, DC, FICAN.

Evans, G.W., M. Bullinger, and S. Hygge. 1998. *Chronic Noise Exposure and Physiological Response: A Prospective Study of Children Living under Environmental Stress*. Psychological Science 9, pp. 75-77.

FAA. 1985. *Airport Improvement Program (AIP) Handbook*. Order No. 100.38.

FICAN. 1997. *Effects of Aviation Noise on Awakenings from Sleep*. June.

FICAN. 2007. *Findings of the FICAN Pilot Study on the Relationship Between Aircraft Noise Reduction and Changes in Standardised Test Scores*. Washington, DC, FICAN.

FICAN. 2008. *FICAN Recommendation for use of ANSI Standard to Predict Awakenings from Aircraft Noise*. December.

FICON. 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*. August.

Fidell, S., and L. Silvati. 2004. *Parsimonious alternatives to regression analysis for characterizing prevalence rates of aircraft noise annoyance*. Noise Control Eng. J. 52, 56–68.

Fidell, S., K. Pearsons, R. Howe, B. Tabachnick, L. Silvati, and D.S. Barber. 1994. *Noise-Induced Sleep Disturbance in Residential Settings*. AL/OE-TR-1994-0131, Wright Patterson AFB, OH, Armstrong Laboratory, Occupational & Environmental Health Division.

Fidell, S., K. Pearsons, B. Tabachnick, R. Howe, L. Silvati, and D.S. Barber. 1995a. *Field study of noise-induced sleep disturbance*. Journal of the Acoustical Society of America 98, No. 2, pp. 1025-1033.

Fidell, S., R. Howe, B. Tabachnick, K. Pearsons, and M. Sneddon. 1995b. *Noise-induced Sleep Disturbance in Residences near Two Civil Airports*. NASA Contractor Report 198252.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. *Community annoyance and sleep disturbance: updated criteria for assessing the impact of general transportation noise on people*. Noise Control Engineering Journal 42, No. 1, pp. 25-30.

Green, K.B., B.S. Pasternack, and R.E. Shore. 1982. *Effects of Aircraft Noise on Reading Ability of School-Age Children.* Archives of Environmental Health 37, No. 1, pp. 24-31.

Griefahn, B. 1978. *Research on Noise Disturbed Sleep Since 1973*. Proceedings of Third Int. Cong. On Noise as a Public Health Problem, pp. 377-390 (as appears in NRC-CNRC NEF Validation Study: (2) Review of Aircraft Noise and Its Effects, A-1505.1, p. 31).

Haines, M.M., S.A. Stansfeld, J. Head, and R.F.S. Job. 2002. *Multilevel modelling of aircraft noise on performance tests in schools around Heathrow Airport London*. Journal of Epidemiology and Community Health 56, 139-144.

Horne, J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond. *A Field Study of Sleep Disturbance: Effects of Aircraft Noise and Other Factors on 5,742 Nights of Actimetrically Monitored Sleep in a Large Subject Sample*. American Sleep Disorders Association and Sleep Research Society: Sleep 17, No. 2, 1994, pp. 146–195.

Klatte M., K. Bergström, T. Lachmann. 2013. *Does noise affect learning? A short review on noise effects on cognitive performance in children*. Frontiers in Psychology 4:578.

Lazarus H. 1990. *New Methods for Describing and Assessing Direct Speech Communication Under Disturbing Conditions*. Environment International 16: 373-392.

Lercher, P., G.W. Evans, and M. Meis. 2003. *Ambient noise and cognitive processes among primary school children*. J. Environment and Behavior 35, 725-735.

Lind S.J., K. Pearsons, and S. Fidell. 1998. *Sound Insulation Requirements for Mitigation of Aircraft Noise Impact on Highline School District Facilities*. Volume I, BBN Systems and Technologies, BBN Report No. 8240.

Lukas, J.S. 1978. *Noise and Sleep: A Literature Review and a Proposed Criterion for Assessing Effect*, In Daryl N. May, ed., *Handbook of Noise Assessment*, Van Nostrand Reinhold Company: New York, pp. 313-334.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G Cavendish. 1988. *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*. US Fish and Wildlife Service National Ecology Research Center, Ft. Collins, CO, NERC-88/29. 88 pp.

Márki, Ferenc. 2013. *Outcomes of EU COSMA (Community Oriented Solutions to Minimise Aircraft Noise Annoyance) Project.* Budapest University of Technology and Economics, London, May.

Miedema, H M, and C G Oudshoorn. 2001. *Annoyance from Transportation Noise: Relationships with Exposure Metrics DNL and DENL and Their Confidence Intervals*." Environmental Health Perspectives 109.4: 409–416.

Miedema, H.M., and H. Vos. 1998. *Exposure-response relationships for transportation noise*. J. Acoust. Soc. Am 104(6): 3432–3445, December.

National Park Service. 1994. *Report to Congress: Report on Effects of Aircraft Overflights on the National Park System*. Prepared Pursuant to Public Law 100-91, The National Parks Overflights Act of 1987. 12 September.

NATO. 2000. *The Effects of Noise from Weapons and Sonic Booms, and the Impact on Humans, Wildlife, Domestic Animals and Structures*. Final Report of the Working Group Study Follow-up Program to the Pilot Study on Aircraft Noise, Report No. 241, June.

Newman, J.S., and K.R. Beattie. 1985. *Aviation Noise Effects*. US Department of Transportation, Federal Aviation Administration Report No. FAA-EE-85-2.

Ollerhead, J.B., C.J. Jones, R.E. Cadoux, A. Woodley, B.J. Atkinson, J.A. Horne, F. Pankhurst, L. Reyner, K.I. Hume, F. Van, A. Watson, I.D. Diamond, P. Egger, D. Holmes, and J. McKean. 1992. *Report of a Field Study of Aircraft Noise and Sleep Disturbance*. Commissioned by the UK Department of Transport for the 36 UK Department of Safety, Environment and Engineering, London, England: Civil Aviation Authority, December.

Pearsons, K.S., D.S. Barber, and B.G. Tabachnick. 1989. *Analyses of the Predictability of Noise-Induced Sleep Disturbance*. US Air Force Report HSD-TR-89-029, October.

Plotkin, K.J., B.H. Sharp, T. Connor, R. Bassarab, I. Flindell, and D. Schreckenberg. 2011. *Updating and Supplementing the Day-Night Average Sound Level (DNL)*. Wyle Report 11-04, DOT/FAA/AEE/2011-03, June.

Rosenblith, W.A., K.N. Stevens, and Staff of Bolt, Beranek, and Newman. 1953. *Handbook of Acoustic Noise Control, Vol. 2, Noise and Man*. US Air Force Report WADC TR-52-204.

Schreckenberg, D. and R. Schuemer. 2010. The Impact of Acoustical, Operational and Non-Auditory Factors on Short-Term Annoyance Due to Aircraft Noise. Inter Noise 2010; Noise and Sustainability. 13 - 16 June 2010, Lisbon, Portugal.

Schultz, T.J. 1978. *Synthesis of social surveys on noise annoyance*. J. Acoust. Soc. Am. 64, No. 2, pp. 377-405, August.

Sharp, B., T. Connor, D. McLaughlin, C. Clark, S. Stansfeld and J. Hervey. 2013. *Assessing Aircraft Noise Conditions Affecting Student Learning*, ACRP Web Document 16, http://www.trb.org/Aviation1/Blurbs/170328.aspx Airport Cooperative Research Program, Transportation Research Board, Washington, DC.

Sharp, B.H., and K.J. Plotkin. 1984. *Selection of Noise Criteria for School Classrooms*. Wyle Research Technical Note TN 84-2 for the Port Authority of New York and New Jersey, October.

Smith, D.G., D.H. Ellis, and T.H. Johnston. 1988. Raptors and Aircraft, In R.L Glinski, B. Gron-Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, and S.W. Hoffman, eds., Proceedings of the Southwest Raptor Management Symposium, National Wildlife Federation, Washington, D.C., pp. 360-367.

Stansfeld, S.A., B. Berglund, and C. Clark, I. Lopez-Barrio, P. Fischer, E. Öhrström, M.M. Haines, J. Head, S. Hygge, and I. van Kamp, B.F. Berry, on behalf of the RANCH study team. 2005. *Aircraft and road traffic noise and children's cognition and health: a cross-national study*. Lancet 365, 1942-1949.

Stansfeld, S.A. and C. Clark. 2015. *Health Effects of Noise Exposure in Children*. Current Environmental Health Reports 2(2): 171-178.

Stevens, K.N., W.A. Rosenblith, and R.H. Bolt. 1953. *Neighborhood Reaction to Noise: A Survey and Correlation of Case Histories (A).* J. Acoust. Soc. Am. 25, 833.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. *The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment*. Wyle Laboratories Research Report WR 92-3, March.

UKDfES. 2003. *Building Bulletin 93, Acoustic Design of Schools - A Design Guide*. London: The Stationary Office.

USEPA. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. USEPA Report 550/9-74-004, March.

USEPA. 1978. *Protective Noise Levels*. Office of Noise Abatement and Control, Washington, DC. USEPA Report 550/9-79-100, November.

Wesler, J.E. 1986. *Priority Selection of Schools for Soundproofing*. Wyle Research Technical Note TN 96-8 for the Port Authority of New York and New Jersey, October.

WHO. 1999. *Guidelines for Community Noise*. Berglund, B., T. Lindvall, and D. Schwela, eds.

Wyle Laboratories. 1970. *Supporting Information for the Adopted Noise Regulations for California Airports*. Wyle Report WCR 70-3(R).

Appendix B-2

Noise Modeling

This page intentionally left blank

B.2 NOISE MODELING

The following sections describe input data used in the noise modeling process. This data was developed in coordination with the Air Force Air Combat Command (ACC), Air Force Civil Engineer Center (AFCEC), and Kelly Field Annex personnel.

B.2.1 Airfield Operations

The first step in estimating the effects of the contract ADAIR action was to determine the baseline operations at Kelly Field Annex. The baseline operations were identified through a recent evaluation of the interim relocation of two F-16 Formal Training Units (FTUs). The FTUs were not relocated to Kelly Field Annex, but the aircraft operations identified from that project were determined appropriate by the Air Force for use as the baseline for the contract ADAIR action with one update: Boeing 767 sorties from the Amazon Corporation (Amazon). The Amazon Boeing 767 sorties were updated to include three sorties per day with the possibility of up to eight sorties per day. Five sorties per day will be used for the baseline as it represents an average number of operations that could occur at the airfield in the near term for Amazon Boeing 767s. The baseline has a total of 64,000 operations at the airfield. **Table B-5** contains the break out of those operations by aircraft type and organization. **Table B-6** contains the operations to be modeled for the baseline as well as the contract ADAIR aircraft operations.

A SORTIE IS A SINGLE FLIGHT, BY ONE AIRCRAFT, FROM TAKEOFF TO LANDING, WHILE A SORTIE-OPERATION IS THE USE OF ONE AIRSPACE UNIT (E.G., MOA) BY ONE AIRCRAFT. THE NUMBER OF SORTIE-OPERATIONS IS USED TO QUANTIFY THE NUMBER OF USES BY AIRCRAFT AND TO ACCURATELY MEASURE POTENTIAL IMPACTS; E.G. NOISE, AIR QUALITY, AND SAFETY IMPACTS. A SORTIE-OPERATION IS NOT A MEASURE OF HOW LONG AN AIRCRAFT USES AN AIRSPACE UNIT, NOR DOES IT INDICATE THE NUMBER OF AIRCRAFT IN AN AIRSPACE UNIT DURING A GIVEN PERIOD; IT IS A MEASUREMENT FOR THE NUMBER OF TIMES A SINGLE AIRCRAFT USES A PARTICULAR AIRSPACE UNIT.

Table B-5
Baseline Operations at Kelly Field Annex

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard / Mil Departure			Straight In Arrivals			Tactical Arrivals			Overhead Break Arrivals			Closed Pattern			Total Annual Operations		
				Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total
Based	149 FW TX ANG	F-16C		1680	70	1750	1680	70	1750	1089	108	1197	417	41	458	1678	167	1845	11200	-	11200	17744	456	18200
	68 AS FTU	C-5M		-	-	-	1014	26	1040	841	199	1040	-	-	-	-	-	-	32606	674	33280	34461	899	35360
	Boeing	C-17		-	-	-	120	-	120	120	-	120	-	-	-	-	-	-	240	-	240	480	-	480
		KC-135 and 747-200	KC-135R	-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-747-400		-	-	-	16	-	16	16	-	16	-	-	-	-	-	-	-	-	-	32	-	32
		C-32	B-757-200-RR	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
		F-15E		-	-	-	22	-	22	22	-	22	-	-	-	-	-	-	-	-	-	44	-	44
		C-40	B-737-D9 (N)	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
	Amazon	B-767		-	-	-	1825	-	1825	1825	-	1825	-	-	-	-	-	-	-	-	-	3650	-	3650
	Gen Aviation	B-757-200-RR		-	-	-	26	2	28	27	1	28	-	-	-	-	-	-	-	-	-	53	3	56
		C-130H&N&P		-	-	-	3	2	5	4	1	5	-	-	-	-	-	-	-	-	-	7	3	10
		COMPOS 1985 PISTON		-	-	-	95	-	95	95	-	95	-	-	-	-	-	-	-	-	-	190	-	190
		DC-9-30D9 (N)		-	-	-	87	4	91	87	4	91	-	-	-	-	-	-	-	-	-	174	8	182
		LEARJET-35		-	-	-	373	15	388	376	12	388	-	-	-	-	-	-	-	-	-	749	27	776
		C-12		-	-	-	79	1	80	79	1	80	-	-	-	-	-	-	-	-	-	158	2	160
		T-6		-	-	-	5	2	7	5	2	7	-	-	-	-	-	-	-	-	-	10	4	14
		UH60A		-	-	-	1163	-	1163	1163	-	1163	-	-	-	-	-	-	-	-	-	2326	-	2326
	Based Totals			**1680**	**70**	**1750**	**6518**	**122**	**6640**	**5759**	**328**	**6087**	**417**	**41**	**458**	**1678**	**167**	**1845**	**44046**	**674**	**44720**	**60098**	**1402**	**61500**
Transient		B-747-200 (N)		-	-	-	25	-	25	25	-	25	-	-	-	-	-	-	-	-	-	50	-	50
		A-10A		-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-737-D9 (N)		-	-	-	32	-	32	31	1	32	-	-	-	-	-	-	-	-	-	63	1	64
		C-12		-	-	-	100	2	102	100	2	102	-	-	-	-	-	-	-	-	-	200	4	204
		C-130H&N&P		-	-	-	183	8	191	176	15	191	-	-	-	-	-	-	-	-	-	359	23	382
		C-17		-	-	-	98	4	102	94	8	102	-	-	-	-	-	-	-	-	-	192	12	204
		C-21A		-	-	-	120	-	120	118	2	120	-	-	-	-	-	-	-	-	-	238	2	240
		C-5A		-	-	-	6	-	6	6	-	6	-	-	-	-	-	-	-	-	-	12	-	12
		F-15E		-	-	-	11	-	11	11	-	11	-	-	-	-	-	-	-	-	-	22	-	22
		F-16A		-	-	-	42	-	42	42	-	42	-	-	-	-	-	-	-	-	-	84	-	84
		F-18A/C		-	-	-	55	-	55	55	-	55	-	-	-	-	-	-	-	-	-	110	-	110
		KC-135R		-	-	-	69	3	72	66	6	72	-	-	-	-	-	-	-	-	-	135	9	144
		T-1		-	-	-	34	-	34	33	1	34	-	-	-	-	-	-	-	-	-	67	1	68
		T-38A		-	-	-	381	8	389	375	14	389	-	-	-	-	-	-	-	-	-	756	22	778
		T-6		-	-	-	21	6	27	19	8	27	-	-	-	-	-	-	-	-	-	40	14	54
		UH60A		-	-	-	38	-	38	38	-	38	-	-	-	-	-	-	-	-	-	76	-	76
	Transient Totals			**-**	**-**	**-**	**1219**	**31**	**1250**	**1193**	**57**	**1250**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2412**	**88**	**2500**
	Grand Totals			1680	70	1750	7737	153	7890	6952	385	7337	417	41	458	1678	167	1845	44046	674	44720	62510	1490	64000

Notes: 1 closed pattern circuit is 2 operations in this table.

Table B-6
Baseline Operations at Kelly Field Annex Plus Contract Adversary Air Operations

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard / Mil Departure			Straight In Arrivals			Tactical Arrivals			Overhead Break Arrivals			Closed Pattern			Total Annual Operations		
				Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total
Based	149 FW TX ANG	F-16C		1680	70	1750	1680	70	1750	1089	108	1197	417	41	458	1678	167	1845	11200	-	11200	17744	456	18200
	ADAIR	CAT A	See note (2)	1152	48	1200	-	-	-	282	108	390	608	-	608	202	-	202	324	-	324	2568	156	2724
	68 AS FTU	C-5M		-	-	-	1014	26	1040	841	199	1040	-	-	-	-	-	-	32606	674	33280	34461	899	35360
	Boeing	C-17		-	-	-	120	-	120	120	-	120	-	-	-	-	-	-	240	-	240	480	-	480
		KC-135 and 747-200	KC-135R	-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-747-400		-	-	-	16	-	16	16	-	16	-	-	-	-	-	-	-	-	-	32	-	32
		C-32	B-757-200-RR	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
		F-15E		-	-	-	22	-	22	22	-	22	-	-	-	-	-	-	-	-	-	44	-	44
		C-40	B-737-D9 (N)	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
	Amazon	B-767		-	-	-	1825	-	1825	1825	-	1825	-	-	-	-	-	-	-	-	-	3650	-	3650
	Gen Aviation	B-757-200-RR		-	-	-	26	2	28	27	1	28	-	-	-	-	-	-	-	-	-	53	3	56
		C-130H&N&P		-	-	-	3	2	5	4	1	5	-	-	-	-	-	-	-	-	-	7	3	10
		COMPOS 1985 PISTON		-	-	-	95	-	95	95	-	95	-	-	-	-	-	-	-	-	-	190	-	190
		DC-9-30D9 (N)		-	-	-	87	4	91	87	4	91	-	-	-	-	-	-	-	-	-	174	8	182
		LEARJET-35		-	-	-	373	15	388	376	12	388	-	-	-	-	-	-	-	-	-	749	27	776
		C-12		-	-	-	79	1	80	79	1	80	-	-	-	-	-	-	-	-	-	158	2	160
		T-6		-	-	-	5	2	7	5	2	7	-	-	-	-	-	-	-	-	-	10	4	14
		UH60A		-	-	-	1163	-	1163	1163	-	1163	-	-	-	-	-	-	-	-	-	2326	-	2326
	Based Totals			**2832**	**118**	**2950**	**6518**	**122**	**6640**	**6041**	**436**	**6477**	**1025**	**41**	**1066**	**1880**	**167**	**2047**	**44370**	**674**	**45044**	**62666**	**1558**	**64224**
Transient		B-747-200 (N)		-	-	-	25	-	25	25	-	25	-	-	-	-	-	-	-	-	-	50	-	50
		A-10A		-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-737-D9 (N)		-	-	-	32	-	32	31	1	32	-	-	-	-	-	-	-	-	-	63	1	64
		C-12		-	-	-	100	2	102	100	2	102	-	-	-	-	-	-	-	-	-	200	4	204
		C-130H&N&P		-	-	-	183	8	191	176	15	191	-	-	-	-	-	-	-	-	-	359	23	382
		C-17		-	-	-	98	4	102	94	8	102	-	-	-	-	-	-	-	-	-	192	12	204
		C-21A		-	-	-	120	-	120	118	2	120	-	-	-	-	-	-	-	-	-	238	2	240
		C-5A		-	-	-	6	-	6	6	-	6	-	-	-	-	-	-	-	-	-	12	-	12
		F-15E		-	-	-	11	-	11	11	-	11	-	-	-	-	-	-	-	-	-	22	-	22
		F-16A		-	-	-	42	-	42	42	-	42	-	-	-	-	-	-	-	-	-	84	-	84
		F-18A/C		-	-	-	55	-	55	55	-	55	-	-	-	-	-	-	-	-	-	110	-	110
		KC-135R		-	-	-	69	3	72	66	6	72	-	-	-	-	-	-	-	-	-	135	9	144
		T-1		-	-	-	34	-	34	33	1	34	-	-	-	-	-	-	-	-	-	67	1	68
		T-38A		-	-	-	381	8	389	375	14	389	-	-	-	-	-	-	-	-	-	756	22	778
		T-6		-	-	-	21	6	27	19	8	27	-	-	-	-	-	-	-	-	-	40	14	54
		UH60A		-	-	-	38	-	38	38	-	38	-	-	-	-	-	-	-	-	-	76	-	76
	Transient Totals			**-**	**-**	**-**	**1219**	**31**	**1250**	**1193**	**57**	**1250**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2412**	**88**	**2500**
	Grand Totals			2832	118	2950	7737	153	7890	7234	493	7727	1025	41	1066	1880	167	2047	44370	674	45044	65078	1646	66724

Notes:
(0) This table represents operations at the airfield. Every operation is an aircraft departing or arriving. 2 closed pattern operations = 1 circuit (1 departing + 1 arriving). 1 sortie = 1 departure + 1 arrival.
(1) F-16C departures are either with AB or MIL power.
(2) ADAIR operations apply only to the Proposed Action scenario to be modeled as F-104D&G, A-4C, and T-45 for high, med, and low noise Category A Proposed Action scenarios, respectively.
(3) Only the F-104D&G has afterburner capability. Other ADAIR aircraft will be modeled with military power departures.
(4) Amazon operations estimated for 5 sorties/day.

B.2.2 Runway and Flight Track Use

This section describes the flight tracks used by the aircraft operating out of Kelly Field Annex as well as the runway utilization. Utilization percentages are provided for each runway in **Table B-7**. Flight track maps for all aircraft are presented on **Figure B-13** (departures), **Figure B-14** (arrivals), and **Figure B-15** (closed patterns).

Table B-7
Runway Usage for Based Aircraft at Kelly Field Annex

Op Type	Runway		
	Runway	**Day (0700-2200)**	**Night (2200-0700)**
Departure	16	77%	3%
	34	19%	1%
Arrival	16	71%	9%
	34	18%	2%
Closed Pattern	16	79%	1%
	34	20%	0%
149th FW usage:	80%/20% for Runways 15/33 all ops 96%/4% for Day/Night Departures 91%/9% for Day/Night Arrivals No Closed Patterns at Night		
443rd AW usage:	80%/20% for Runways 15/33 all ops 97.5%/2.5% for Day/Night Departures 81%/19% for Day/Night Arrivals 98%/2% for Day/Night Closed Patterns		

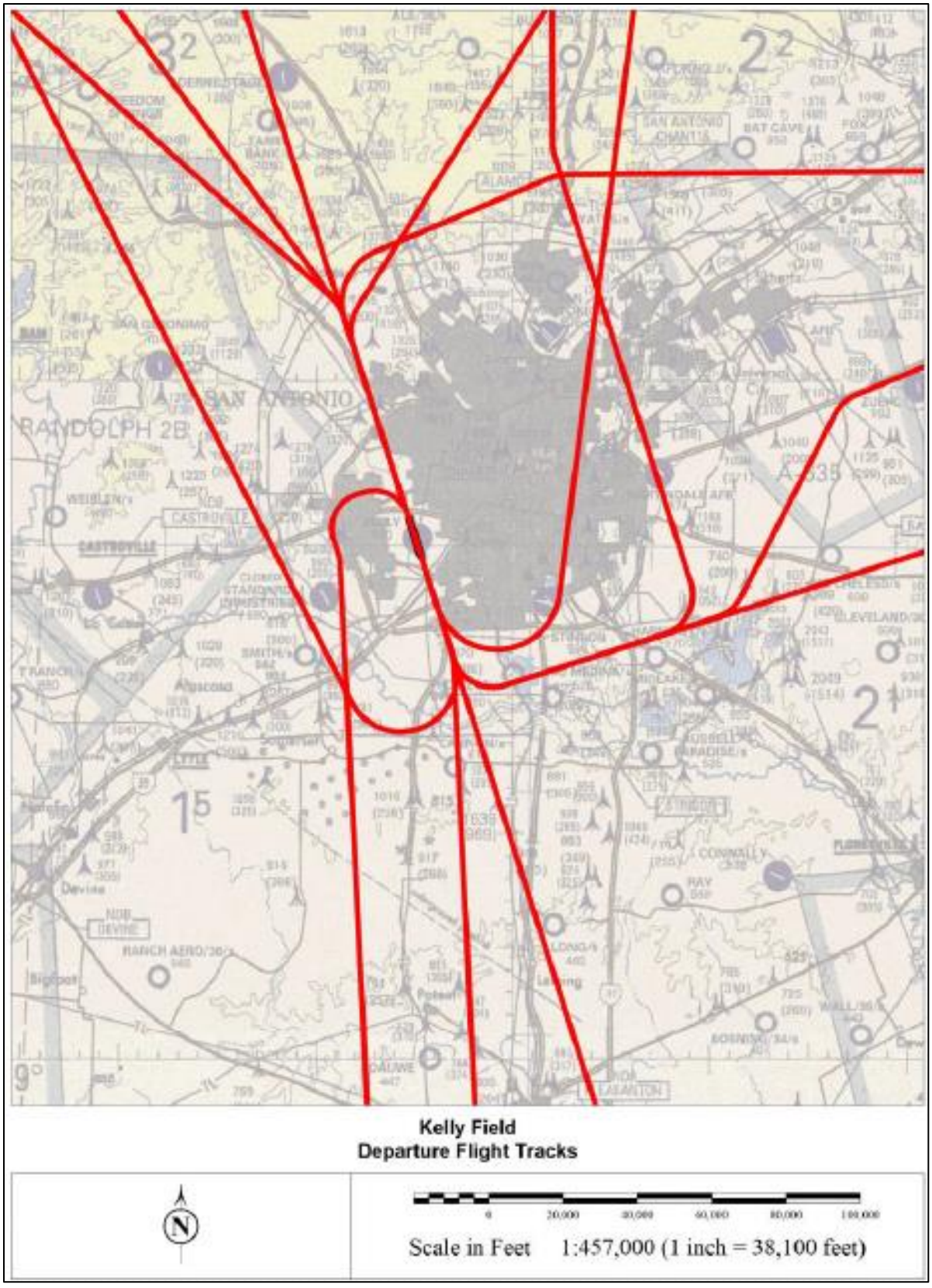


Figure B-13. Departure Flight Tracks at Kelly Field Annex.

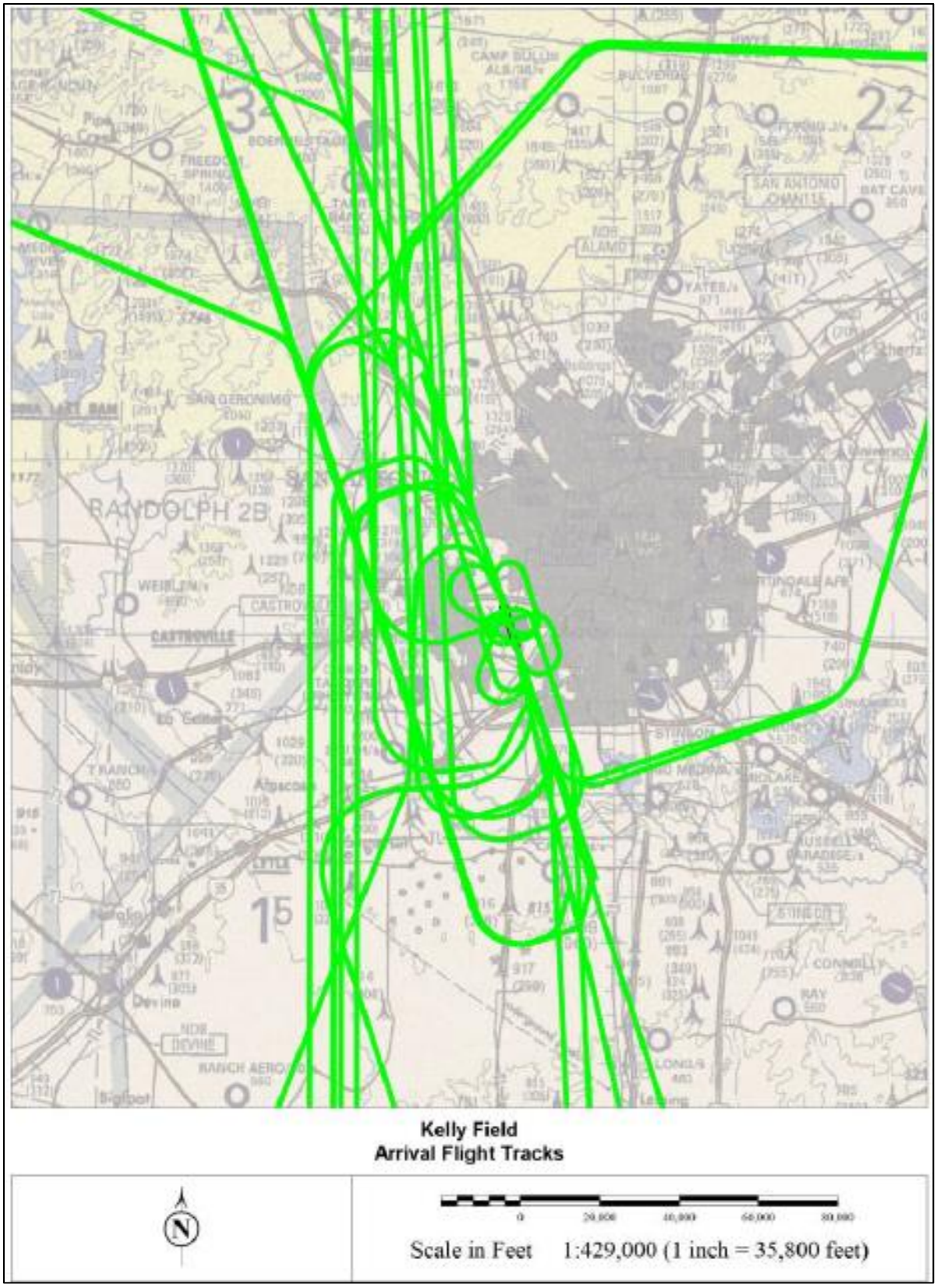


Figure B-14. Arrival Flight Tracks at Kelly Field Annex.

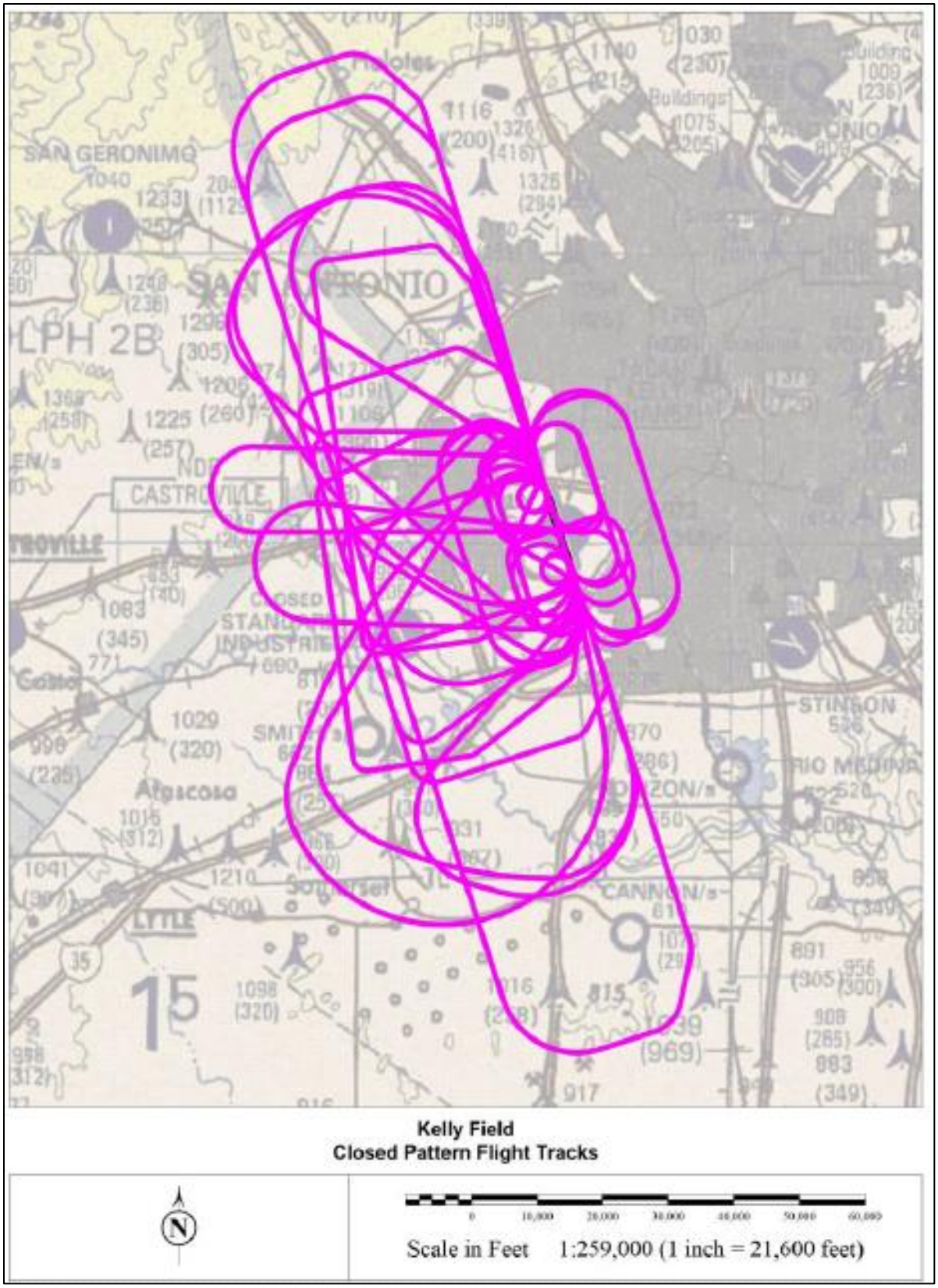


Figure B-15. Closed Pattern Flight Tracks at Kelly Field Annex.

B.2.3 Flight Profiles and Aircraft

The ADAIR program would locate contractor aircraft at Kelly Field Annex with the appropriate capabilities to respond to the needs of the fighters at the bases. The Air Force identified three categories of aircraft with differing capabilities (A, B, and C) as appropriate for contract ADAIR. To fulfill the requirements of a category the contractor could provide a variety of aircraft with the appropriate specifications. Because the type of aircraft for contract ADAIR are not known at this time, representative noise surrogates were selected for the lowest through highest potential noise emission scenarios for the aircraft that contractors may select to provide for each of the categories. The surrogate selected for the different categories and scenarios are presented in **Table B-8**. To model a given noise scenario for a certain category, all contract ADAIR flight operations were assigned to the surrogate. The Air Force determined that contract ADAIR at Kelly Field Annex could be provided by Category A aircraft. All three scenarios for Category A will be modeled separately in the final analysis for Kelly Field Annex.

Table B-8
Aircraft Scenarios

Category	High Noise Scenario	Medium Noise Scenario	Low Noise Scenario
A	A-4N (A-4C surrogate)	MiG-21 (F-104D&G surrogate)	L-59 (T-45 surrogate)
B	F-5 (F-5E surrogate)	A-4K (A-4C surrogate)	T-59 Hawk (T-45 surrogate)
C	Eurofighter Typhoon (F-18E/F surrogate)	Dassault Mirage (F-16C surrogate)	JAS 39 Gripen (F-16A surrogate)

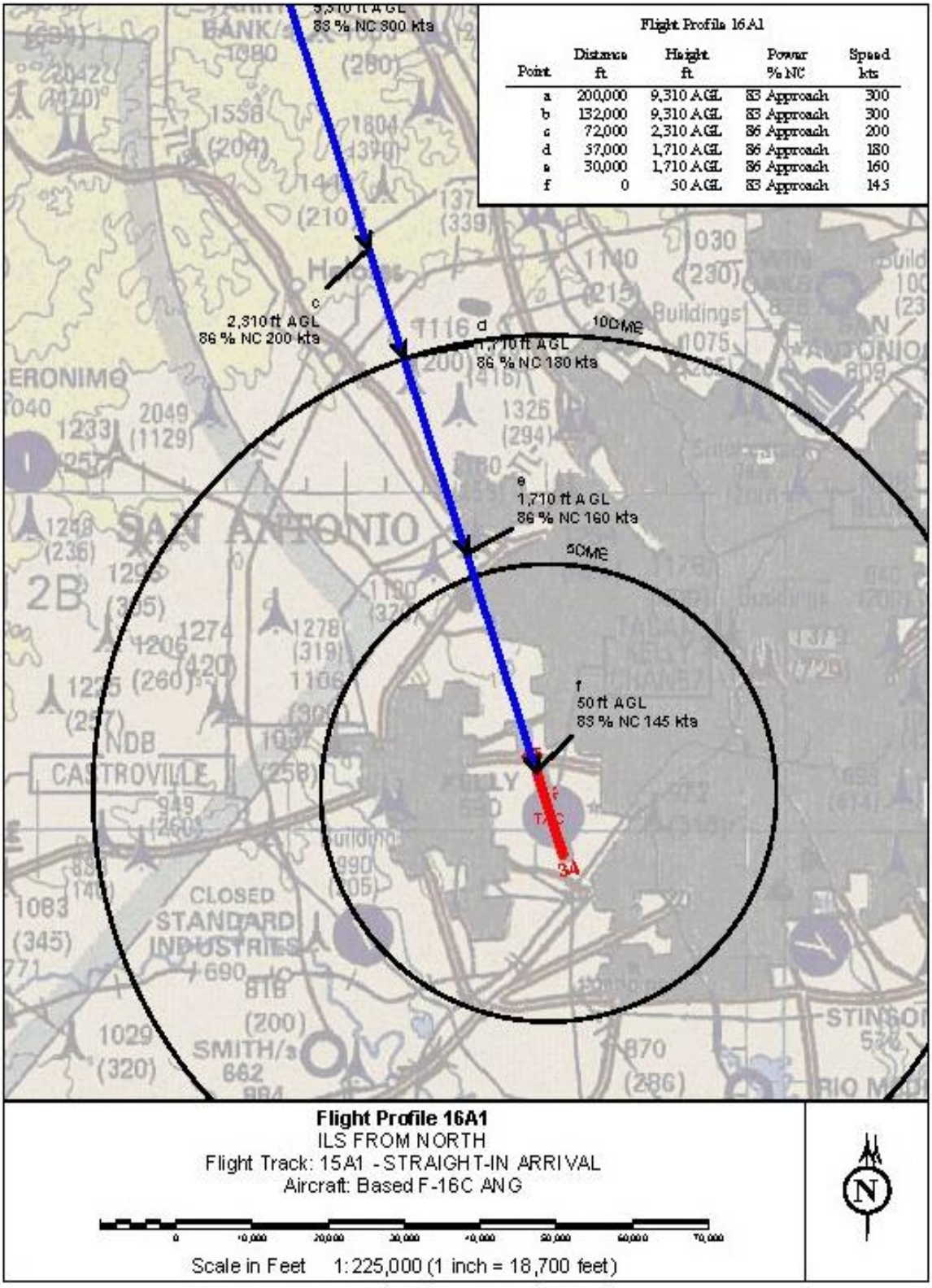
This section details the representative profiles for each aircraft that is based at Kelly Field Annex. This includes the F-16C aircraft of the 149th FW, the C-5Ms of the 433rd AW, and the proposed contract ADAIR aircraft for Category A. The Category A aircraft are modeled as the T-45 for the low-noise scenario, the F-104 for the medium-noise scenario, and the A-4C for the high-noise scenario. Because it is unknown which aircraft type or combination thereof that the contractor will bring to Kelly Field Annex, each scenario is modeled separately as if it were the only aircraft in the contract ADAIR inventory.

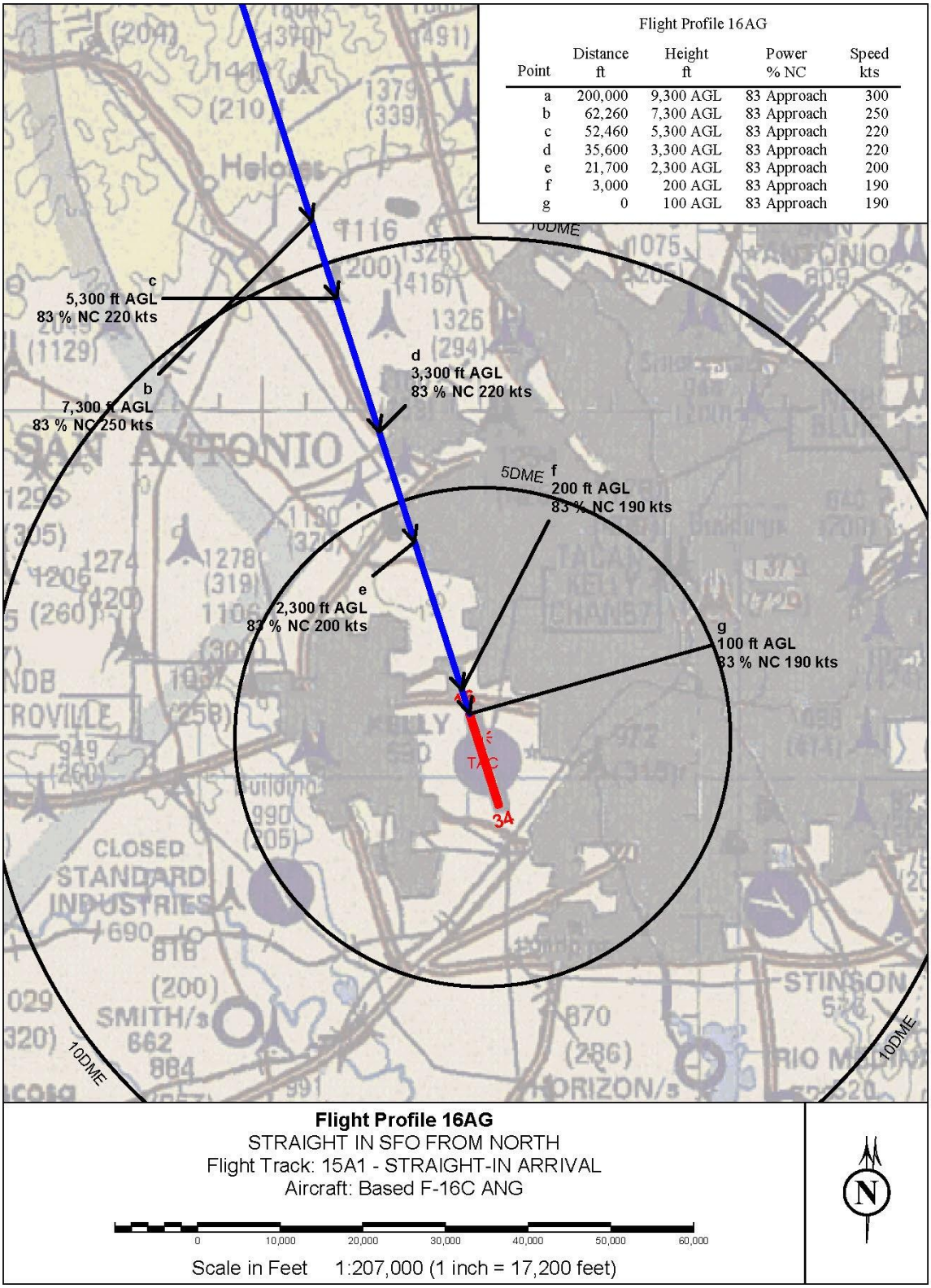
Representative profiles provide the speed and power setting of each type of aircraft as a function of distance along the flight track for the representative maneuvers. For modeling purposes, the appropriate profile is used for all flight tracks that conform to that maneuver type. For example, all overhead break arrival tracks utilize the representative profile for modeling that maneuver.

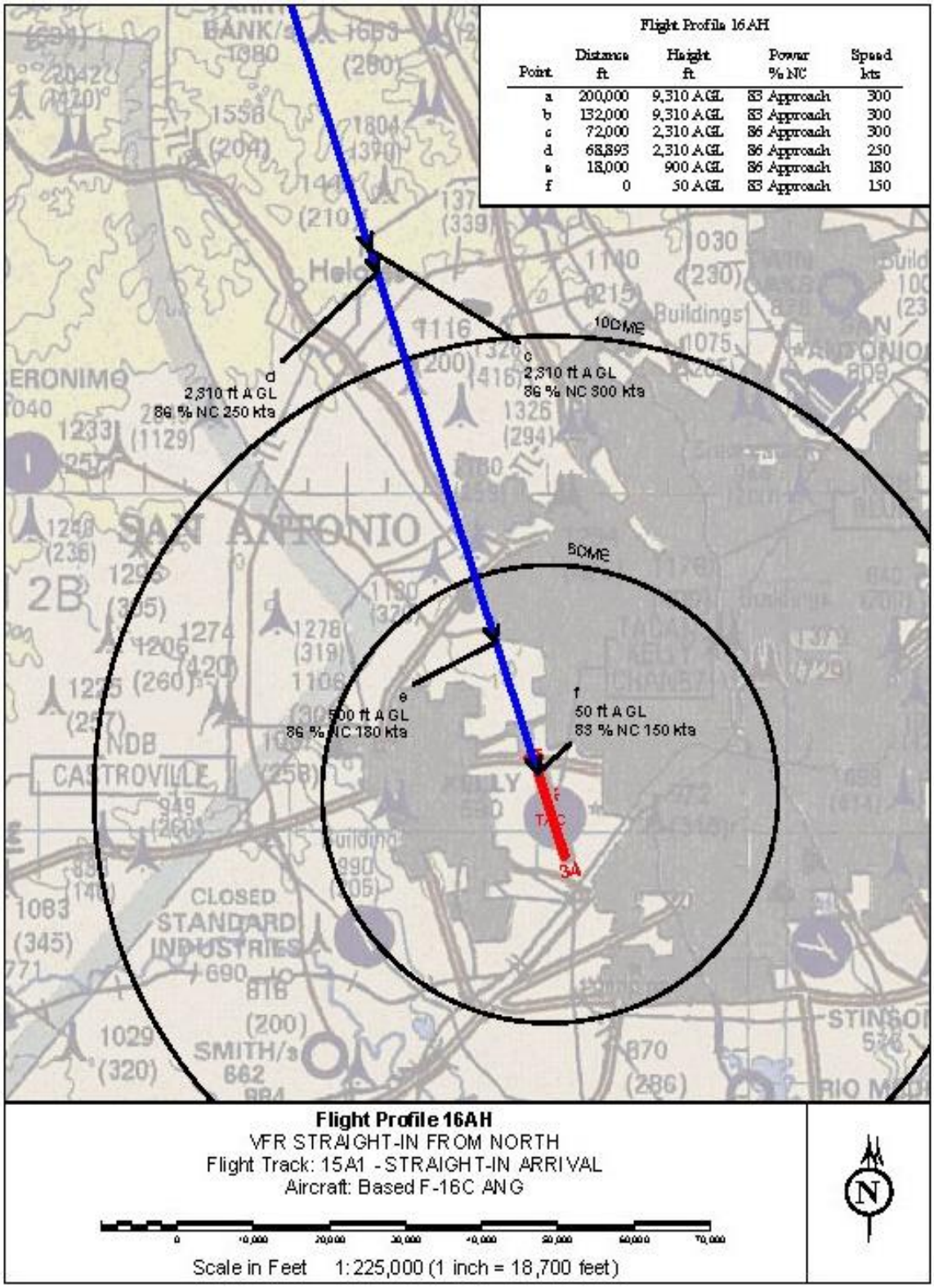
A note on the runways at Kelly Field Annex: they recently were renamed from 15 to 16 and 33 to 34. The figures below have descriptions that reference the profiles in terms of the old runway names. Because the noise model anchors the profile to the location of the runway the name of the runway does not affect the resulting noise calculations.

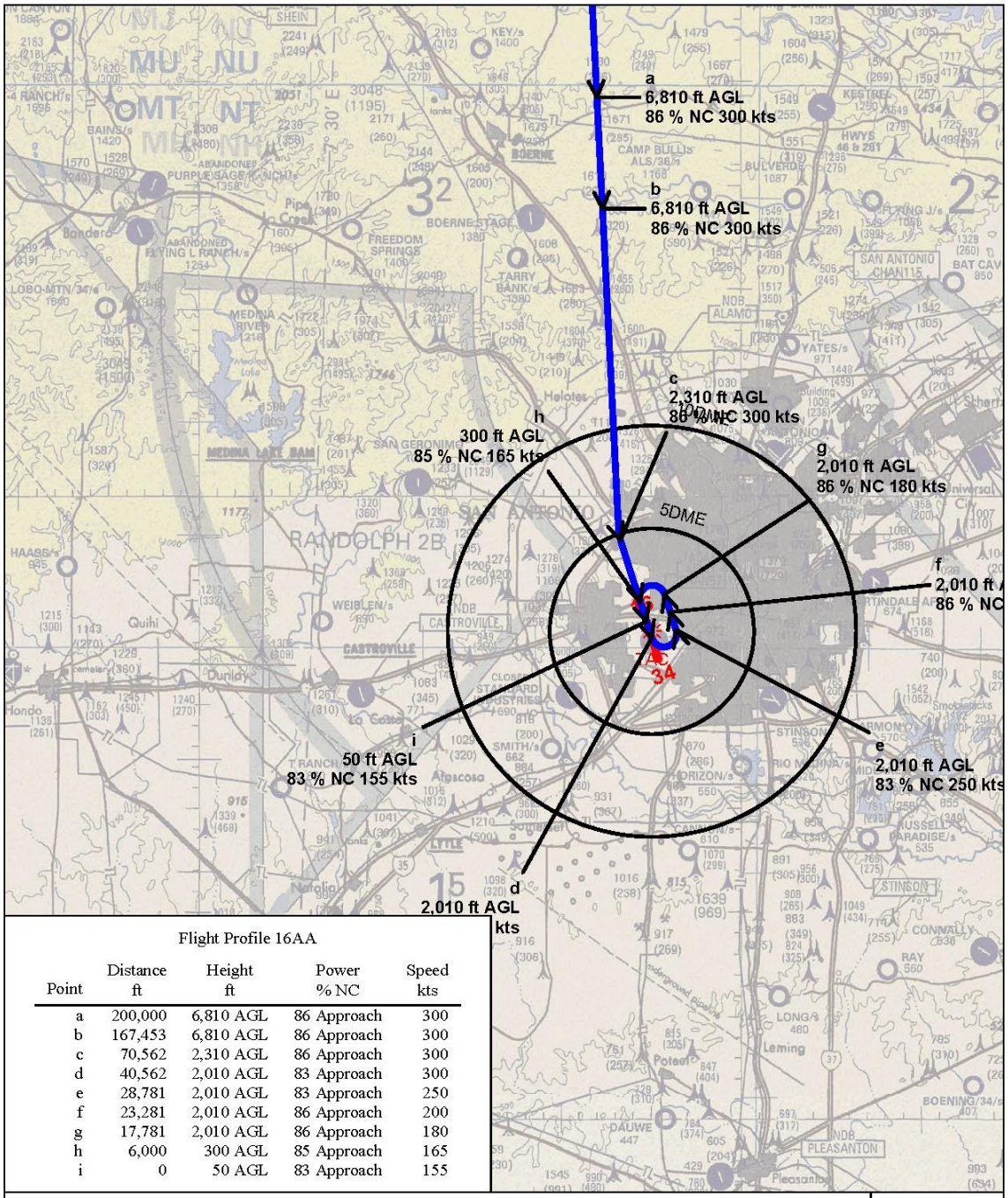
B.2.3.1 Based Aircraft Representative Flight Profiles

Flight Profiles for 149th Fight Wing F-16Cs




Flight Profile 16AG
Point | Distance ft | Height ft | Power % NC | Speed kts
a | 200,000 | 9,300 AGL | 83 Approach | 300
b | 62,260 | 7,300 AGL | 83 Approach | 250
c | 52,460 | 5,300 AGL | 83 Approach | 220
d | 35,600 | 3,300 AGL | 83 Approach | 220
e | 21,700 | 2,300 AGL | 83 Approach | 200
f | 3,000 | 200 AGL | 83 Approach | 190
g | 0 | 100 AGL | 83 Approach | 190
c
5,300 ft AGL
83 % NC 220 kts
b
7,300 ft AGL
83 % NC 250 kts
d
3,300 ft AGL
83 % NC 220 kts
5DME
f
200 ft AGL
83 % NC 190 kts
e
2,300 ft AGL
83 % NC 200 kts
g
100 ft AGL
83 % NC 190 kts
34
10DME
10DME
SAN ANTONIO
Flight Profile 16AG
STRAIGHT IN SFO FROM NORTH
Flight Track: 15A1 - STRAIGHT-IN ARRIVAL
Aircraft: Based F-16C ANG
0
10,000
20,000
30,000
40,000
50,000
60,000
Scale in Feet 1:207,000 (1 inch = 17,200 feet)
N

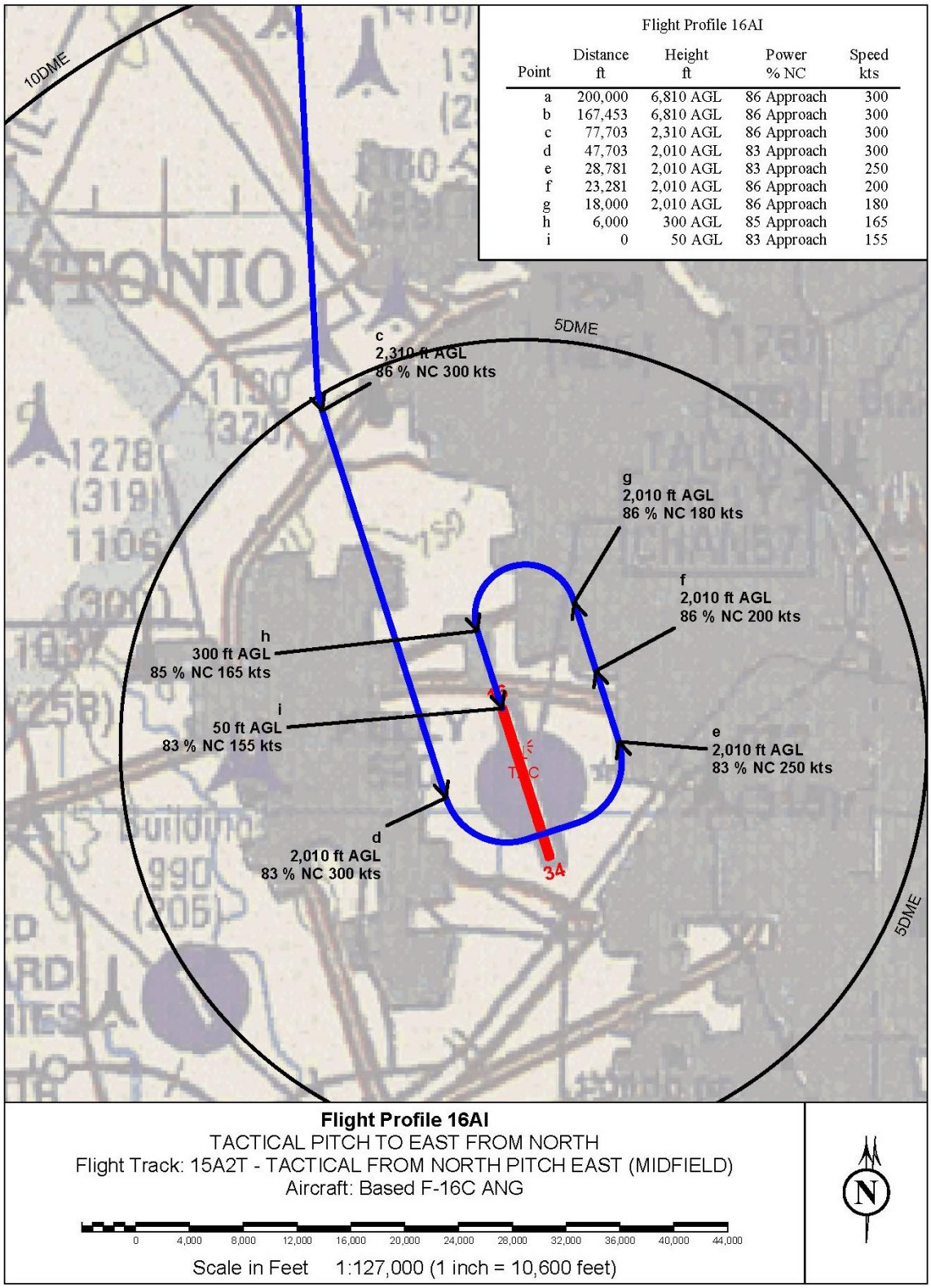

Flight Profile 16AH
Point | Distance ft | Height ft | Power % NC | Speed kts
a | 200,000 | 9,310 AGL | 83 Approach | 300
b | 132,000 | 9,310 AGL | 83 Approach | 300
c | 72,000 | 2,310 AGL | 86 Approach | 300
d | 68,893 | 2,310 AGL | 86 Approach | 250
e | 18,000 | 900 AGL | 86 Approach | 180
f | 0 | 50 AGL | 83 Approach | 150
10DME
50DME
c
2,310 ft AGL
86 % NC 300 kts
d
2,310 ft AGL
86 % NC 250 kts
e
900 ft AGL
86 % NC 180 kts
f
50 ft AGL
83 % NC 150 kts
34
SAN ANTONIO
CASTROVILLE
CLOSED
STANDARD
INDUSTRIES
SMITH/s
Buildings
Flight Profile 16AH
VFR STRAIGHT-IN FROM NORTH
Flight Track: 15A1 - STRAIGHT-IN ARRIVAL
Aircraft: Based F-16C ANG
Scale in Feet 1:225,000 (1 inch = 18,700 feet)
N



Flight Profile 16AA

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	86 Approach	300
b	167,453	6,810 AGL	86 Approach	300
c	70,562	2,310 AGL	86 Approach	300
d	40,562	2,010 AGL	83 Approach	300
e	28,781	2,010 AGL	83 Approach	250
f	23,281	2,010 AGL	86 Approach	200
g	17,781	2,010 AGL	86 Approach	180
h	6,000	300 AGL	85 Approach	165
i	0	50 AGL	83 Approach	155

Flight Profile 16AA
PITCH TO EAST FROM NORTH
Flight Track: 15A2 - FROM NORTH PITCH TO EAST (MIDFIELD)
Aircraft: Based F-16C ANG

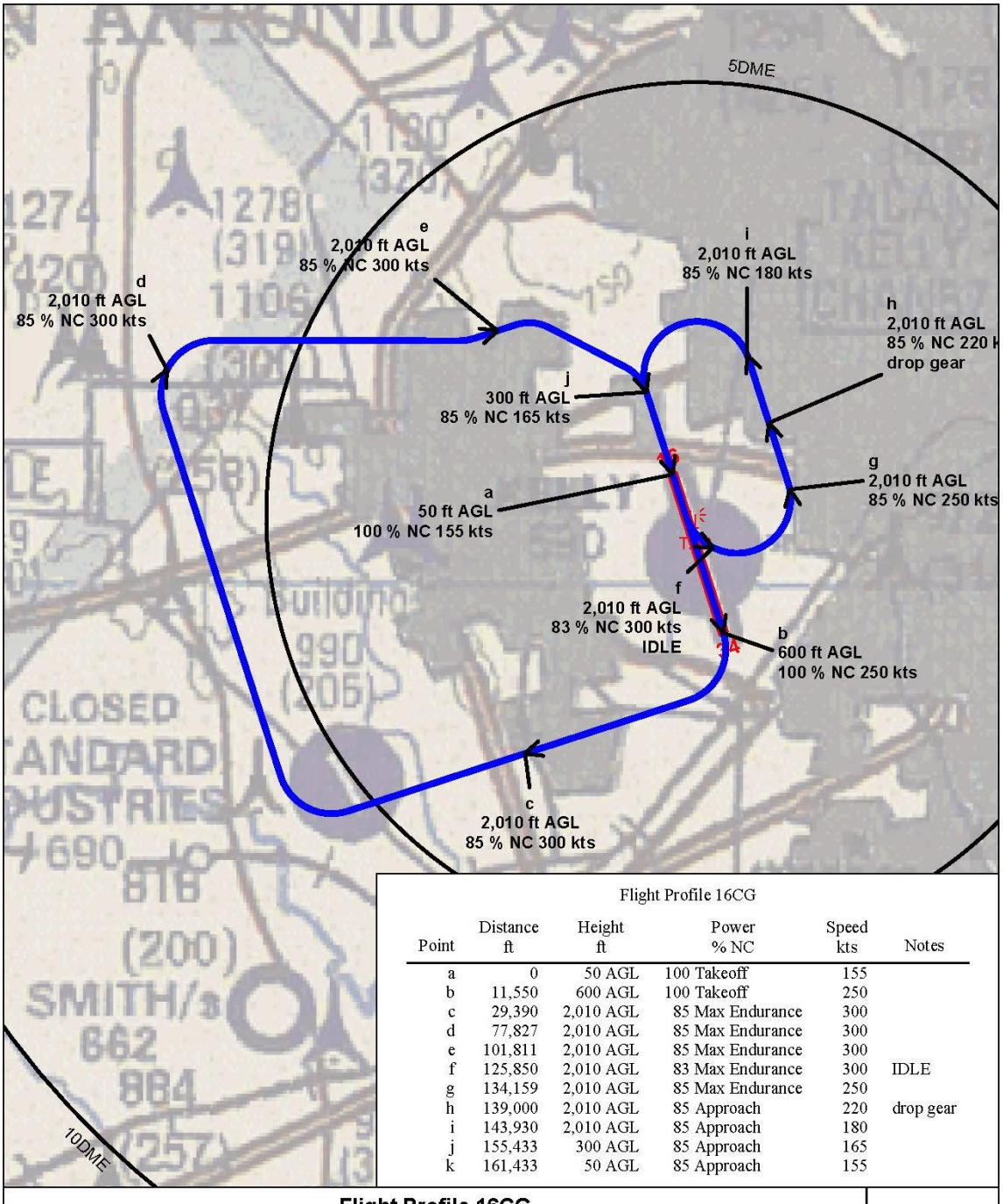


Flight Profile 16AI

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	86 Approach	300
b	167,453	6,810 AGL	86 Approach	300
c	77,703	2,310 AGL	86 Approach	300
d	47,703	2,010 AGL	83 Approach	300
e	28,781	2,010 AGL	83 Approach	250
f	23,281	2,010 AGL	86 Approach	200
g	18,000	2,010 AGL	86 Approach	180
h	6,000	300 AGL	85 Approach	165
i	0	50 AGL	83 Approach	155

Flight Profile 16AI
TACTICAL PITCH TO EAST FROM NORTH
Flight Track: 15A2T - TACTICAL FROM NORTH PITCH EAST (MIDFIELD)
Aircraft: Based F-16C ANG

Scale in Feet 1:127,000 (1 inch = 10,600 feet)



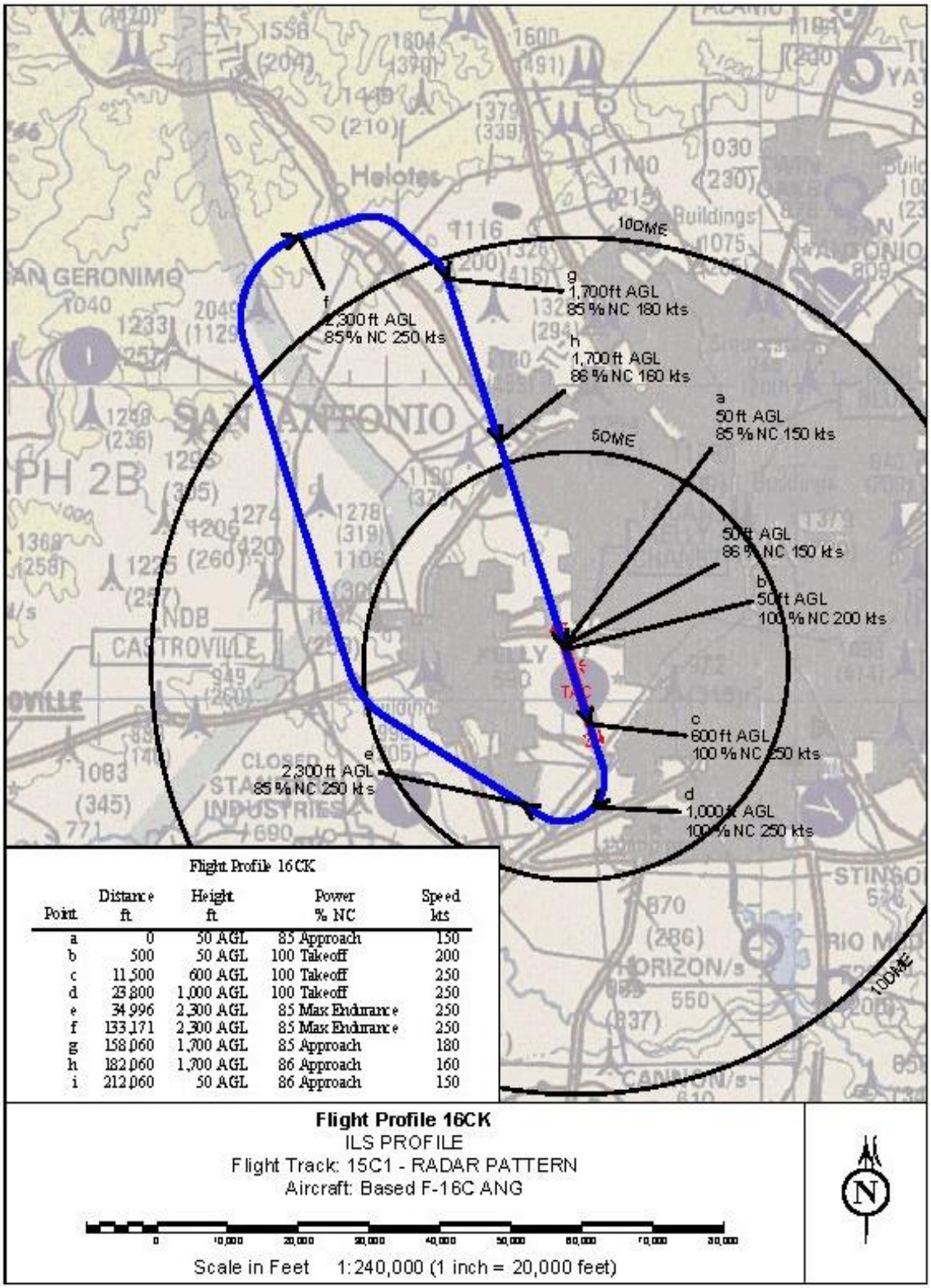
Flight Profile 16CG

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	100 Takeoff	155	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	85 Max Endurance	300	
d	77,827	2,010 AGL	85 Max Endurance	300	
e	101,811	2,010 AGL	85 Max Endurance	300	
f	125,850	2,010 AGL	83 Max Endurance	300	IDLE
g	134,159	2,010 AGL	85 Max Endurance	250	
h	139,000	2,010 AGL	85 Approach	220	drop gear
i	143,930	2,010 AGL	85 Approach	180	
j	155,433	300 AGL	85 Approach	165	
k	161,433	50 AGL	85 Approach	155	

Flight Profile 16CG
REENTRY TO PITCH
Flight Track: 15C0 - VFR REENTRY PATTERN TO PITCH (E)
Aircraft: Based F-16C ANG

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:128,000 (1 inch = 10,700 feet)



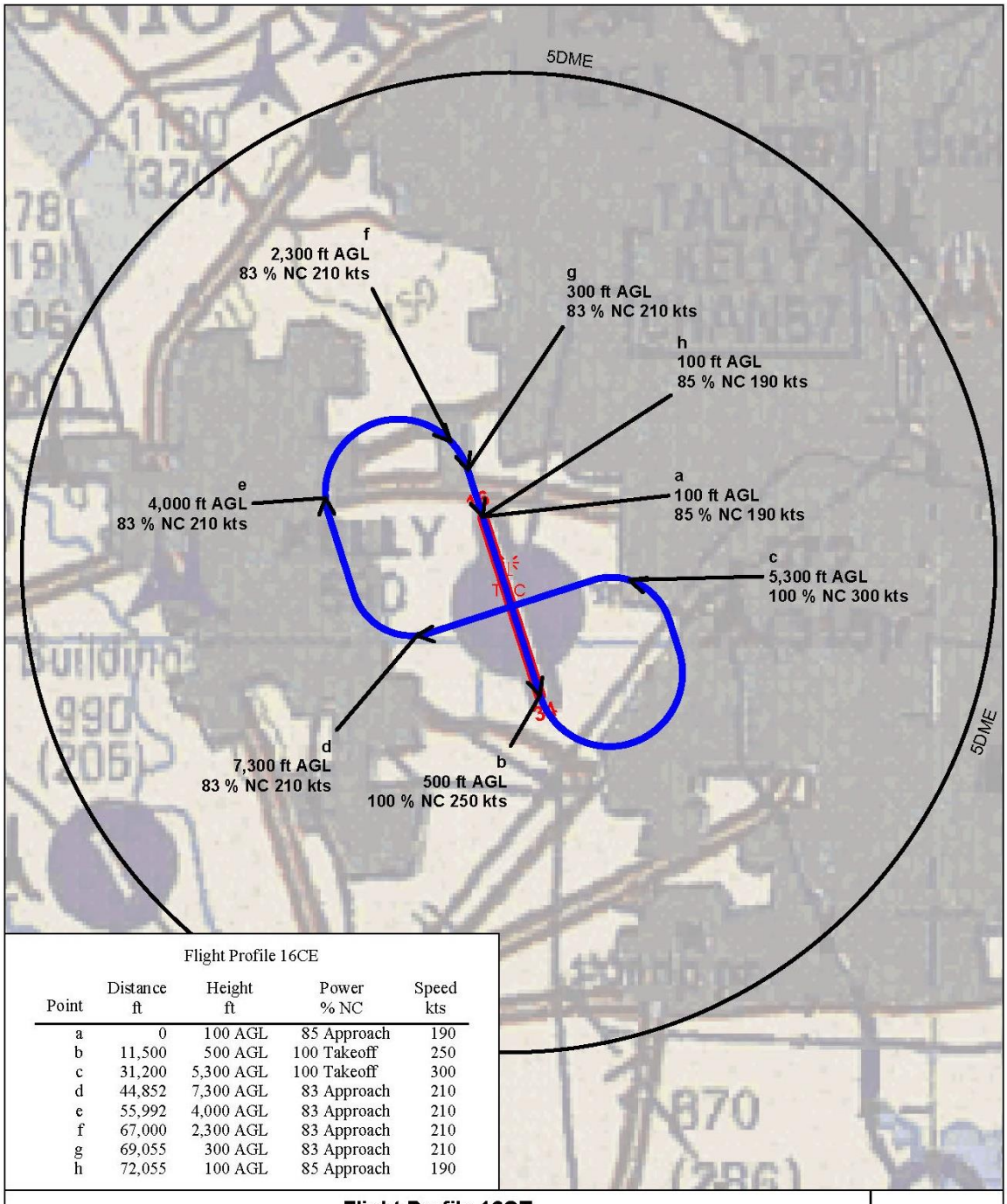
Flight Profile 16CK

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	50 AGL	85 Approach	150
b	500	50 AGL	100 Takeoff	200
c	11,500	600 AGL	100 Takeoff	250
d	23,800	1,000 AGL	100 Takeoff	250
e	34,996	2,300 AGL	85 Max Endurance	250
f	133,171	2,300 AGL	85 Max Endurance	250
g	158,060	1,700 AGL	85 Approach	180
h	182,060	1,700 AGL	86 Approach	160
i	212,060	50 AGL	86 Approach	150

Flight Profile 16CK
ILS PROFILE
Flight Track: 15C1 - RADAR PATTERN
Aircraft: Based F-16C ANG

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000

Scale in Feet 1:240,000 (1 inch = 20,000 feet)



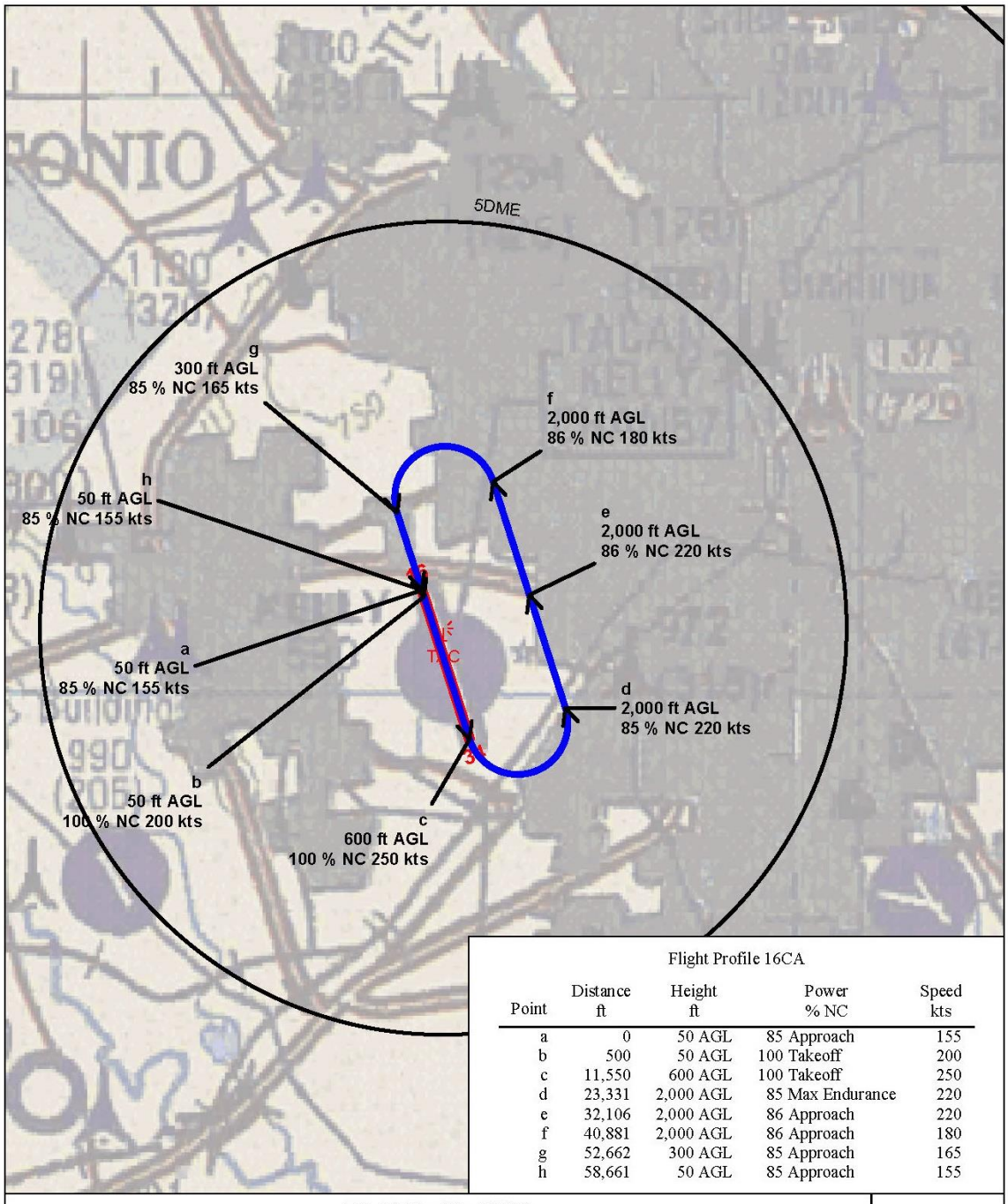
Flight Profile 16CE

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	100 AGL	85 Approach	190
b	11,500	500 AGL	100 Takeoff	250
c	31,200	5,300 AGL	100 Takeoff	300
d	44,852	7,300 AGL	83 Approach	210
e	55,992	4,000 AGL	83 Approach	210
f	67,000	2,300 AGL	83 Approach	210
g	69,055	300 AGL	83 Approach	210
h	72,055	100 AGL	85 Approach	190

Flight Profile 16CE
SFO PROFILE
Flight Track: 15C3 - CLOSED SFO
Aircraft: Based F-16C ANG

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:113,000 (1 inch = 9,460 feet)



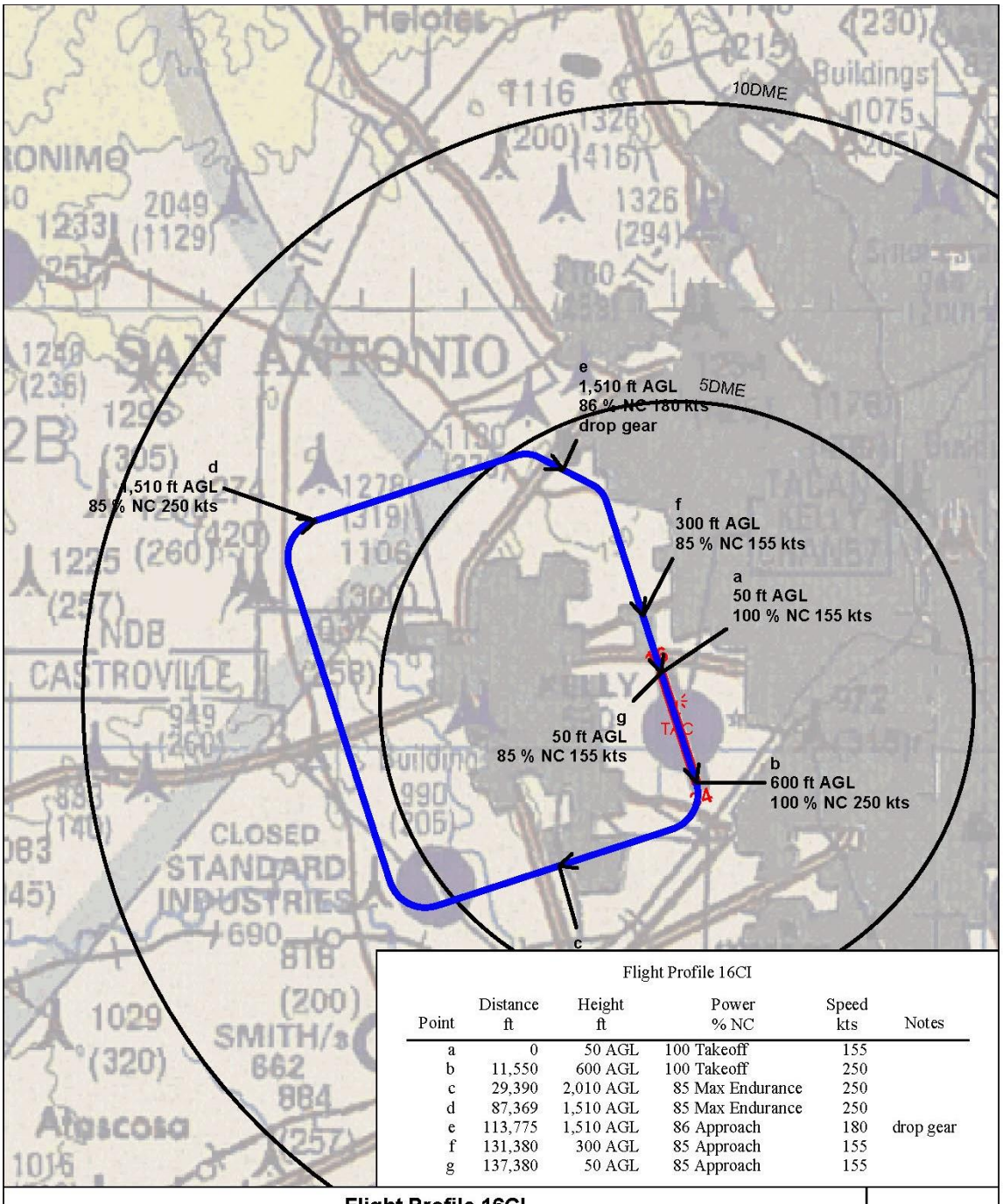
Flight Profile 16CA

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	50 AGL	85 Approach	155
b	500	50 AGL	100 Takeoff	200
c	11,550	600 AGL	100 Takeoff	250
d	23,331	2,000 AGL	85 Max Endurance	220
e	32,106	2,000 AGL	86 Approach	220
f	40,881	2,000 AGL	86 Approach	180
g	52,662	300 AGL	85 Approach	165
h	58,661	50 AGL	85 Approach	155

Flight Profile 16CA
VFR PATTERN TO EAST
Flight Track: 15C4 - VISUAL CLOSED TO EAST
Aircraft: Based F-16C ANG

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:137,000 (1 inch = 11,400 feet)



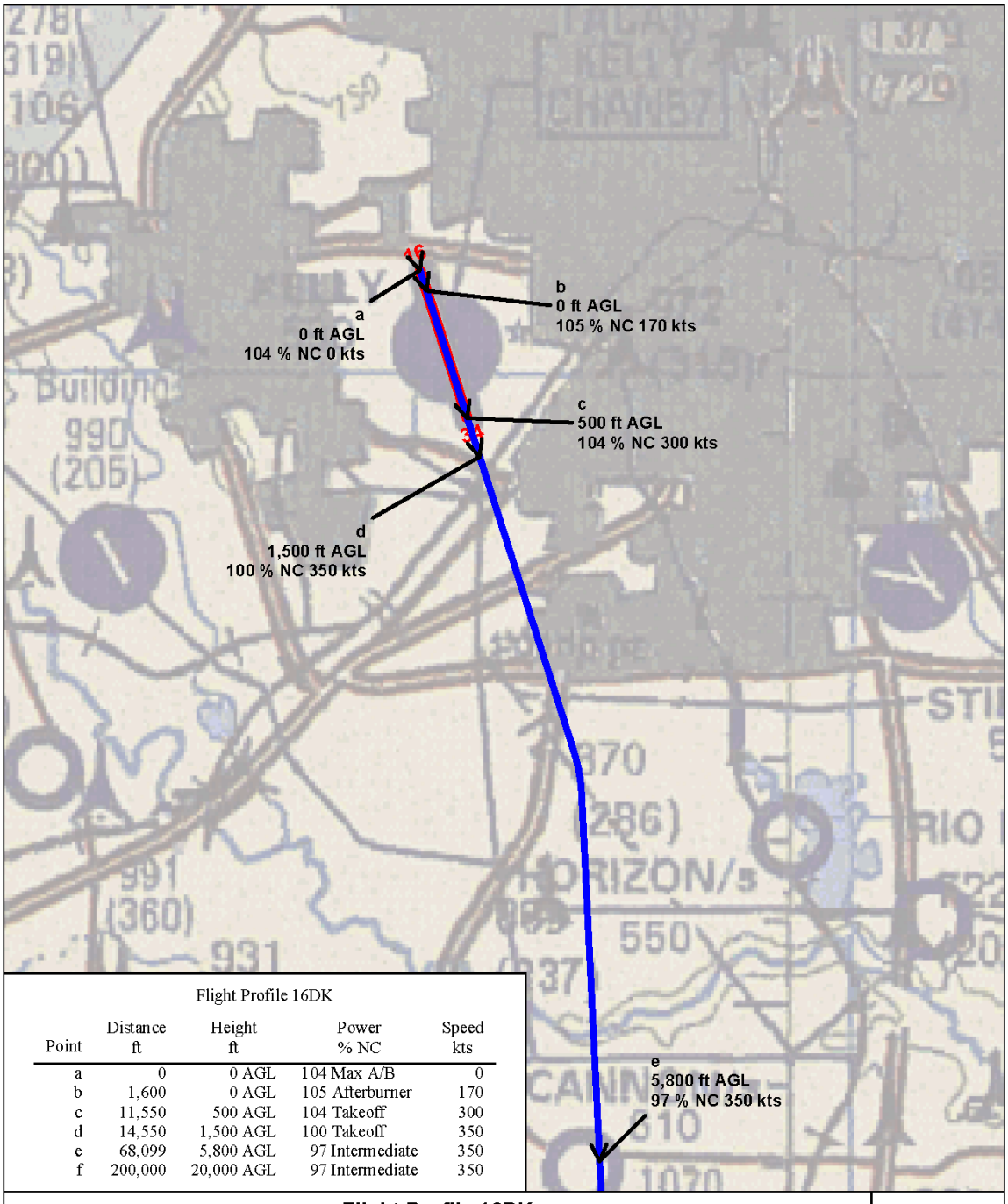
Flight Profile 16CI

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	100 Takeoff	155	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	85 Max Endurance	250	
d	87,369	1,510 AGL	85 Max Endurance	250	
e	113,775	1,510 AGL	86 Approach	180	drop gear
f	131,380	300 AGL	85 Approach	155	
g	137,380	50 AGL	85 Approach	155	

Flight Profile 16CI
REENTRY TO STRAIGHT-IN 3 MILE FINAL
Flight Track: 15C9 - VFR REENTRY PATTERN 3 MILE FINAL TO STRAIGHT-IN
Aircraft: Based F-16C ANG

0 10,000 20,000 30,000 40,000 50,000 60,000

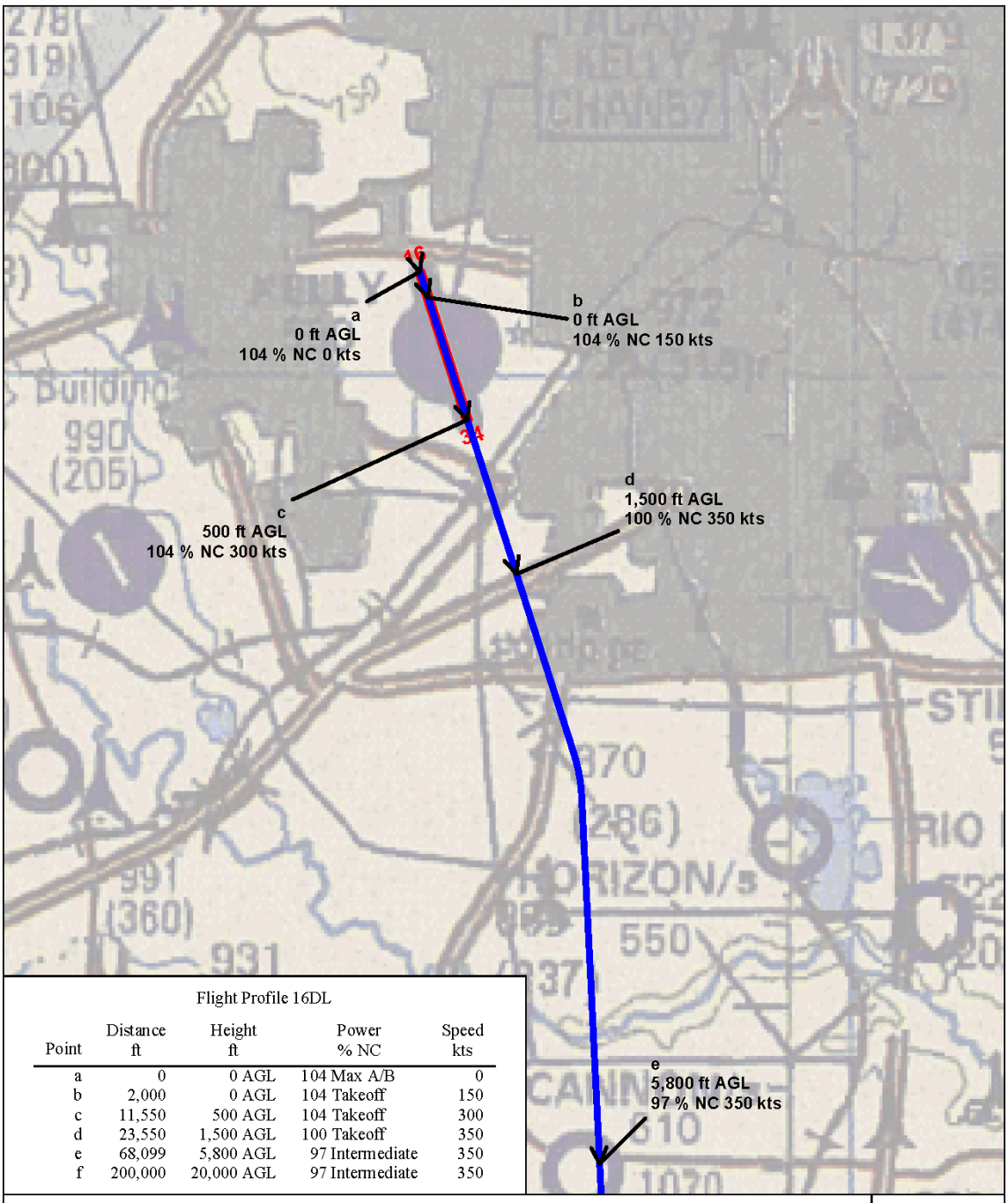
Scale in Feet 1:185,000 (1 inch = 15,500 feet)



Flight Profile 16DK

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	104 Max A/B	0
b	1,600	0 AGL	105 Afterburner	170
c	11,550	500 AGL	104 Takeoff	300
d	14,550	1,500 AGL	100 Takeoff	350
e	68,099	5,800 AGL	97 Intermediate	350
f	200,000	20,000 AGL	97 Intermediate	350

Flight Profile 16DK
A/B TO CRYSTAL MOA AIR TO AIR OPS
Flight Track: 15D6 - TO CRYSTAL MOA OR 170 HDG
Aircraft: Based F-16C ANG



Flight Profile 16DL

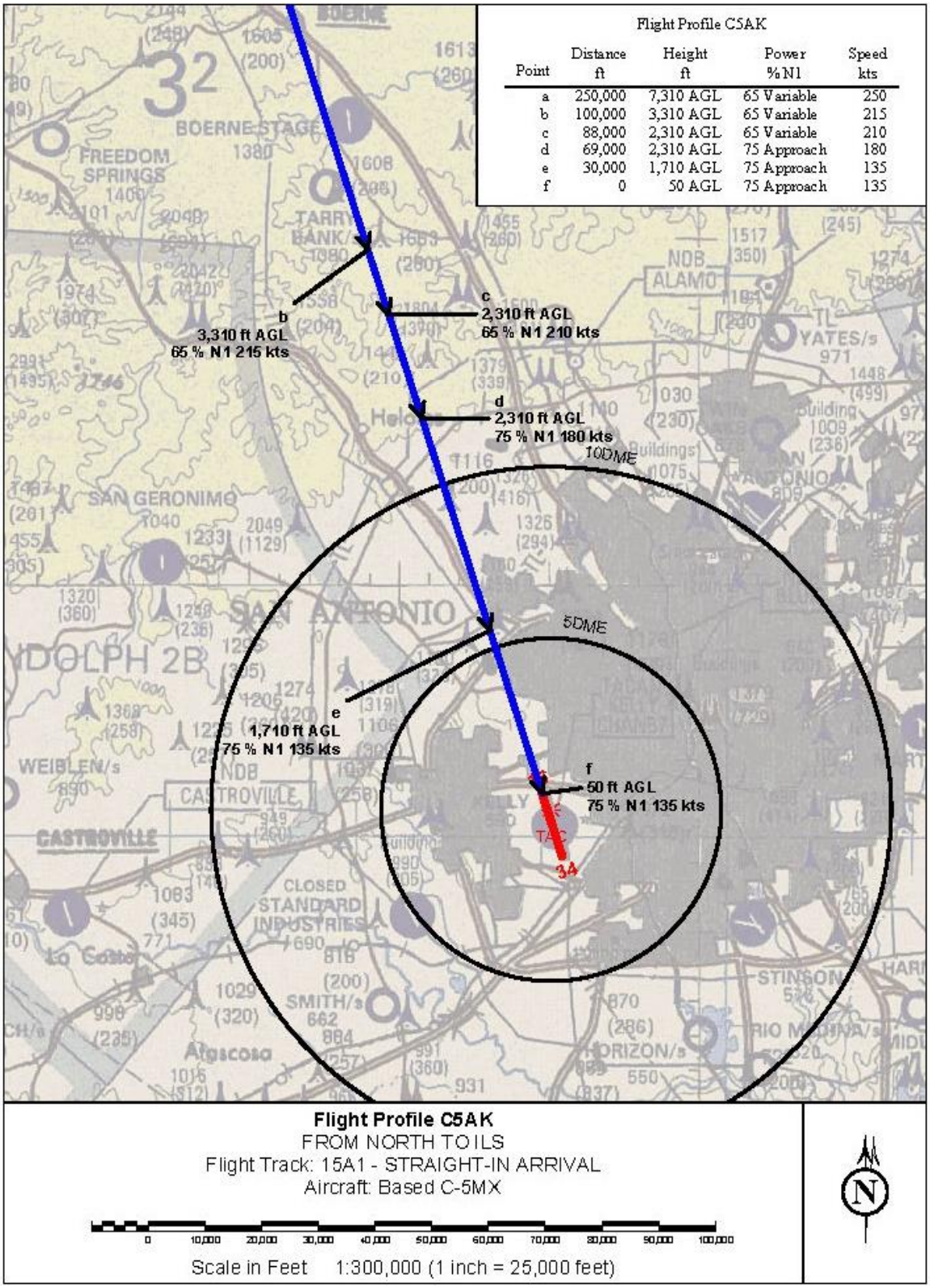
Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	104 Max A/B	0
b	2,000	0 AGL	104 Takeoff	150
c	11,550	500 AGL	104 Takeoff	300
d	23,550	1,500 AGL	100 Takeoff	350
e	68,099	5,800 AGL	97 Intermediate	350
f	200,000	20,000 AGL	97 Intermediate	350

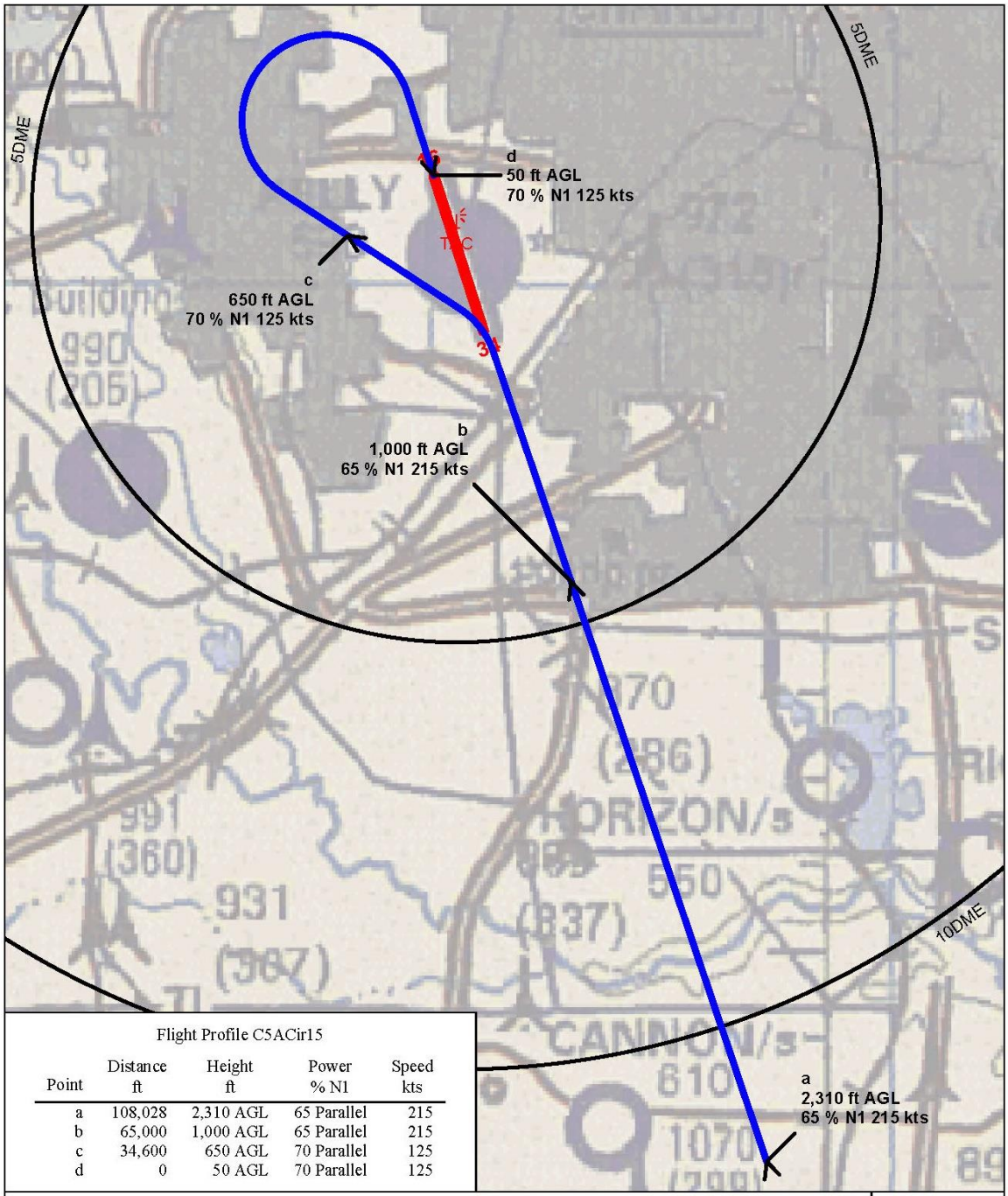
Flight Profile 16DL
MILITARY TO CRYSTAL MOA AIR TO AIR OPS
Flight Track: 15D6 - TO CRYSTAL MOA OR 170 HDG
Aircraft: Based F-16C ANG

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:138,000 (1 inch = 11,500 feet)

Flight Profiles for 433rd Airlift Wing C-5Ms





Flight Profile C5ACir15

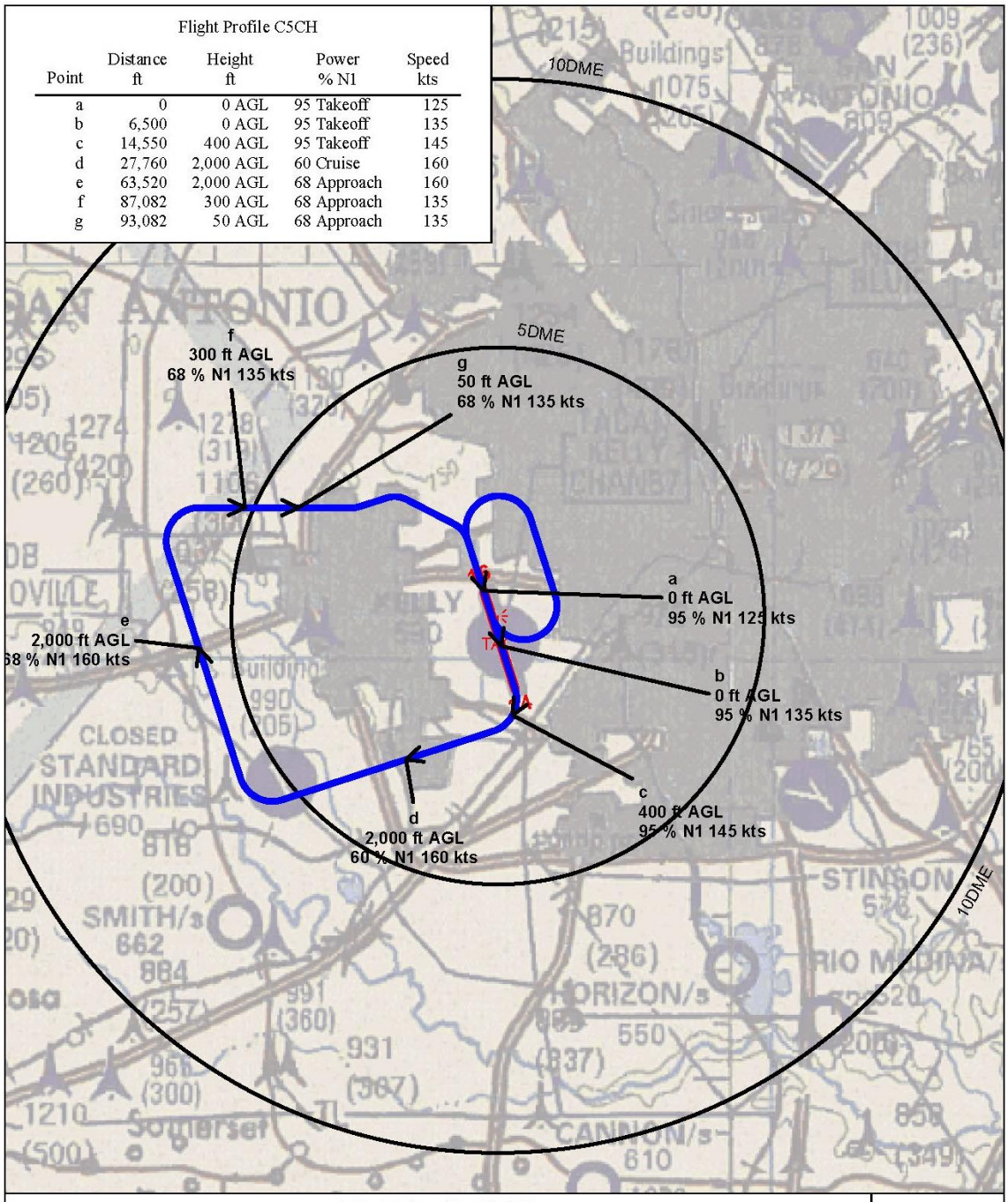
Point	Distance ft	Height ft	Power % N1	Speed kts
a	108,028	2,310 AGL	65 Parallel	215
b	65,000	1,000 AGL	65 Parallel	215
c	34,600	650 AGL	70 Parallel	125
d	0	50 AGL	70 Parallel	125

Flight Profile C5ACir15
R33 to R15 Circle
Flight Track: 15AEa - Circle arrival from R33 to R15
Aircraft: Based C-5MX

Scale in Feet 1:130,000 (1 inch = 10,900 feet)

Flight Profile C5CH

Point	Distance ft	Height ft	Power % N1	Speed kts
a	0	0 AGL	95 Takeoff	125
b	6,500	0 AGL	95 Takeoff	135
c	14,550	400 AGL	95 Takeoff	145
d	27,760	2,000 AGL	60 Cruise	160
e	63,520	2,000 AGL	68 Approach	160
f	87,082	300 AGL	68 Approach	135
g	93,082	50 AGL	68 Approach	135



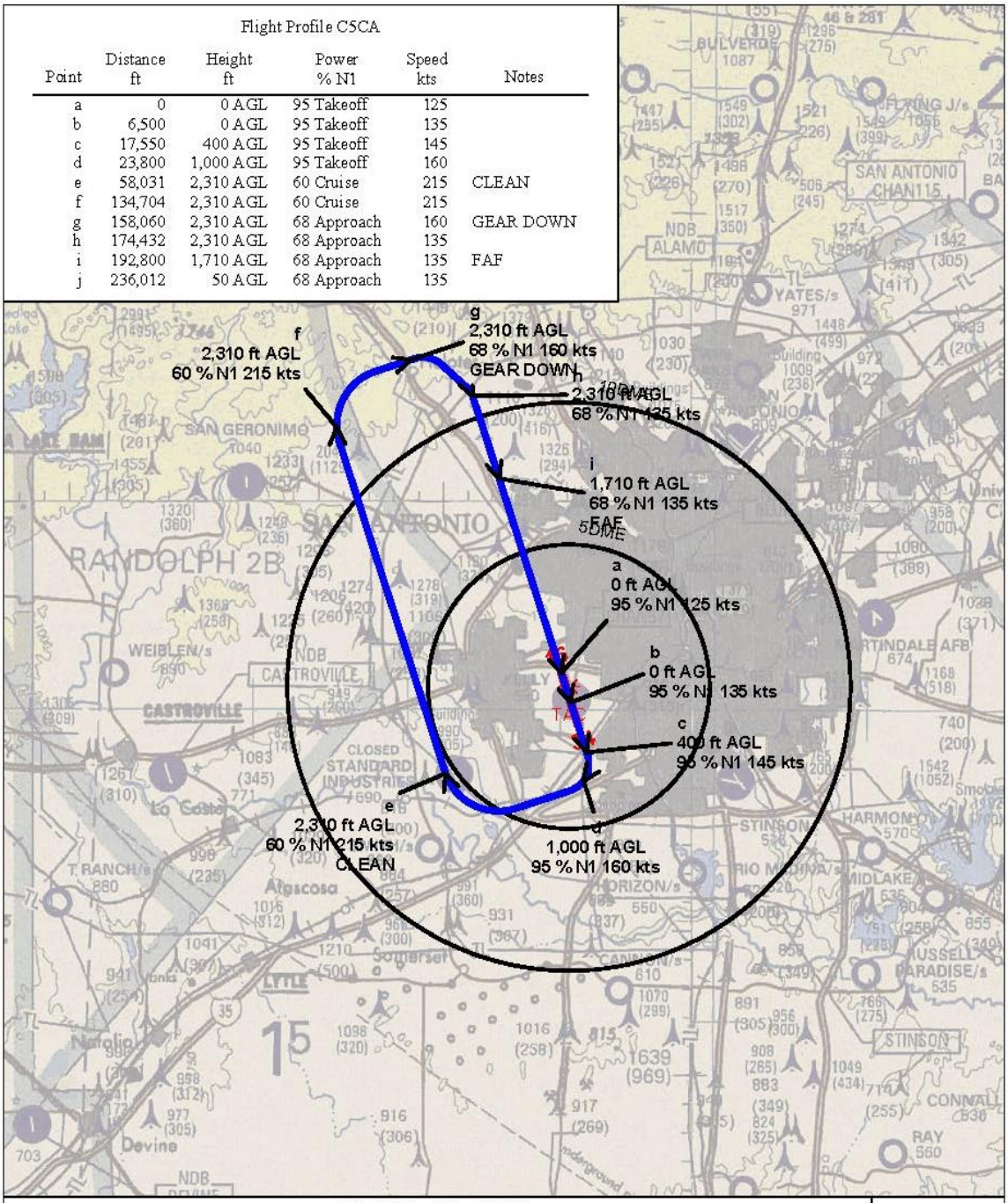
Flight Profile C5CH
VFR TO WEST OUTSIDE WILFORD HALL
Flight Track: 15C0 - VFR REENTRY PATTERN TO PITCH (E)
Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:208,000 (1 inch = 17,300 feet)

Flight Profile C5CA

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	0 AGL	95 Takeoff	125	
b	6,500	0 AGL	95 Takeoff	135	
c	17,550	400 AGL	95 Takeoff	145	
d	23,800	1,000 AGL	95 Takeoff	160	
e	58,031	2,310 AGL	60 Cruise	215	CLEAN
f	134,704	2,310 AGL	60 Cruise	215	
g	158,060	2,310 AGL	68 Approach	160	GEAR DOWN
h	174,432	2,310 AGL	68 Approach	135	
i	192,800	1,710 AGL	68 Approach	135	FAF
j	236,012	50 AGL	68 Approach	135	

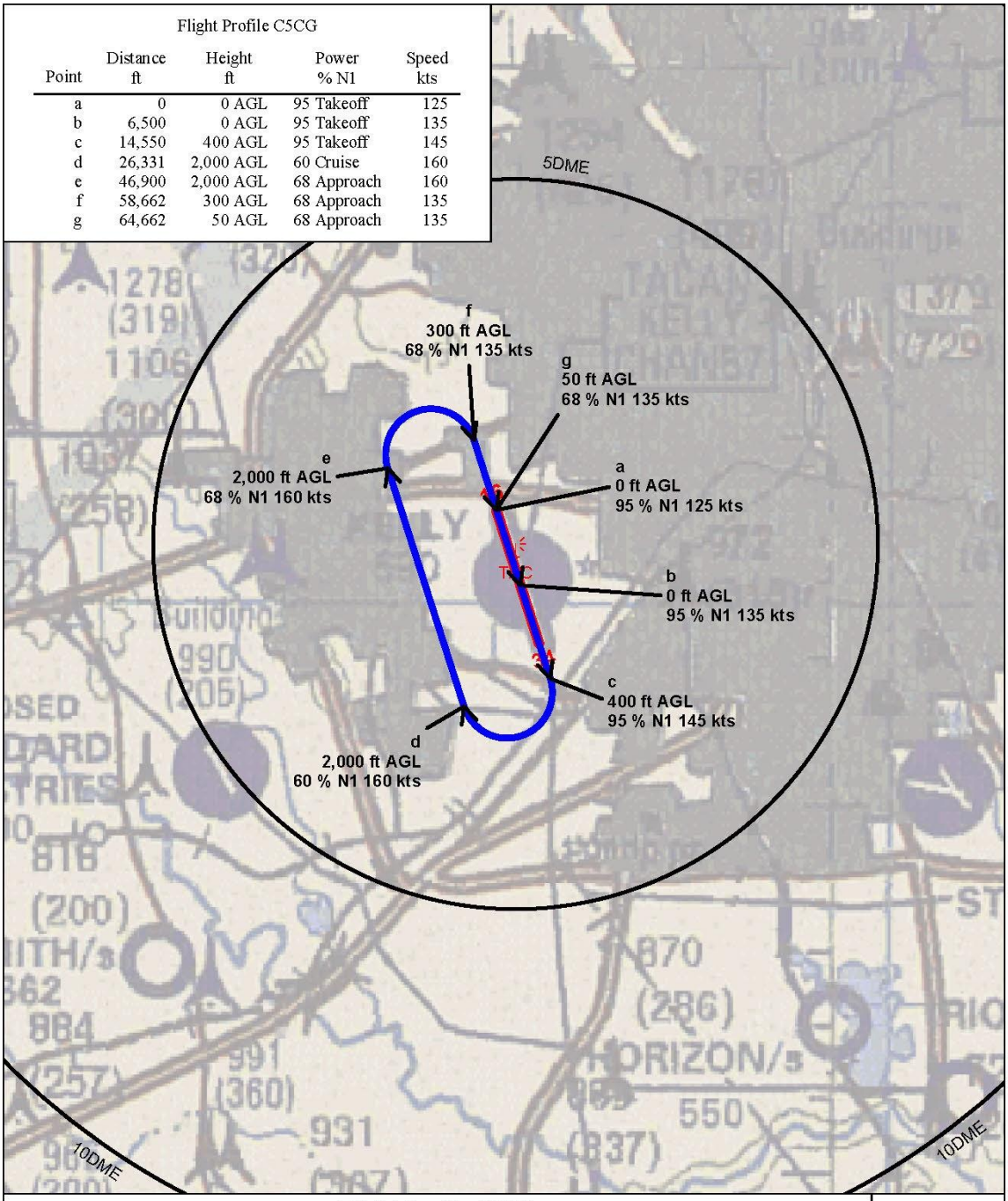


Flight Profile C5CA
PROFICIENCY SORTIE ILS PROFILE
Flight Track: 15C1a - TRACK CHANGED MAY 2002 and validated 2014
Aircraft: Based C-5MX

Scale in Feet 1:393,000 (1 inch = 32,800 feet)

Flight Profile C5CG

Point	Distance ft	Height ft	Power % N1	Speed kts
a	0	0 AGL	95 Takeoff	125
b	6,500	0 AGL	95 Takeoff	135
c	14,550	400 AGL	95 Takeoff	145
d	26,331	2,000 AGL	60 Cruise	160
e	46,900	2,000 AGL	68 Approach	160
f	58,662	300 AGL	68 Approach	135
g	64,662	50 AGL	68 Approach	135



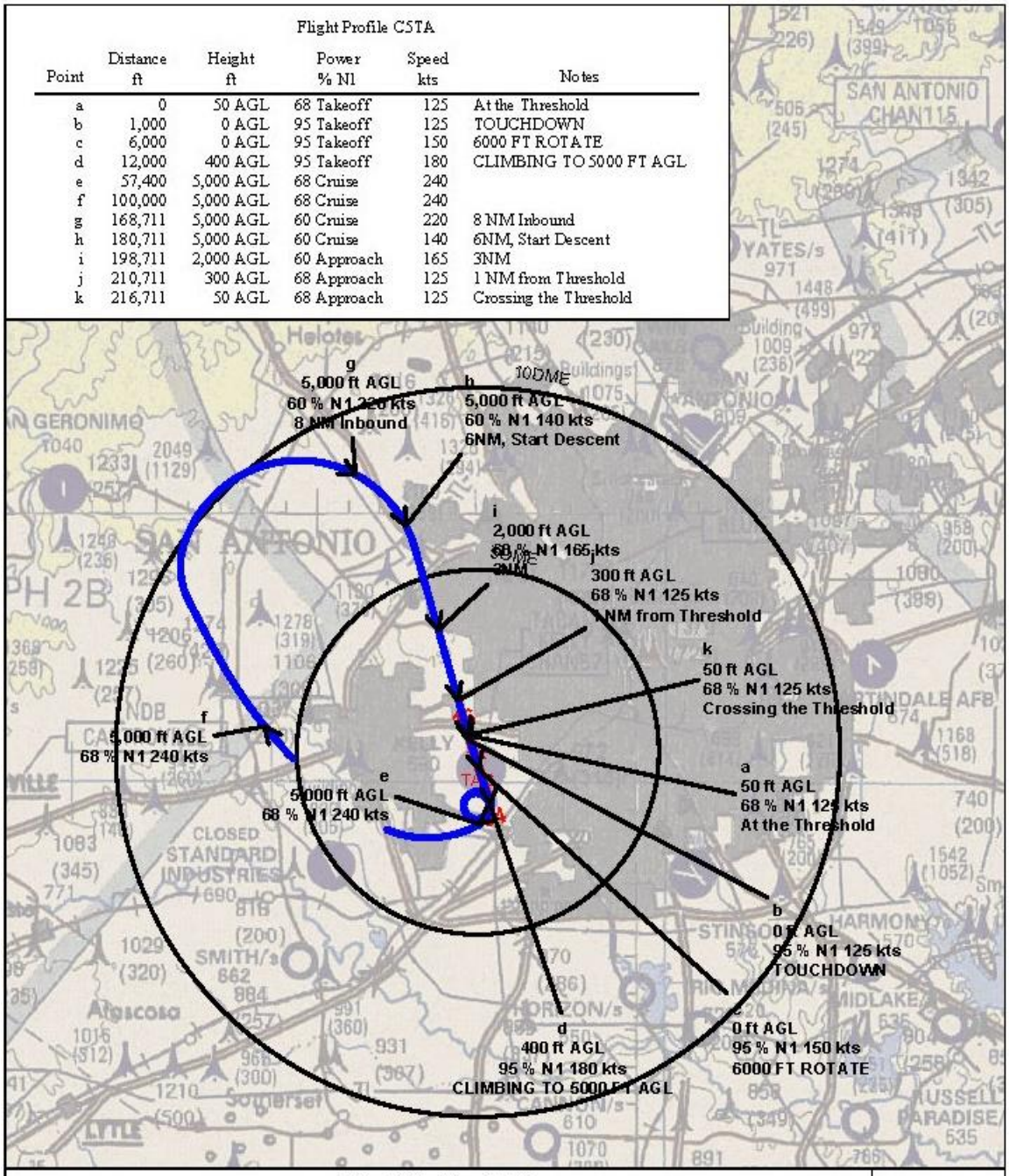
Flight Profile C5CG
VFR TO WEST INSIDE WILFORD HALL
Flight Track: 15C8 - INSIDE WILFORD HALL
Aircraft: Based C-5MX

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000 52,000

Scale in Feet 1:153,000 (1 inch = 12,700 feet)

Flight Profile C5TA

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Takeoff	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	125	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	12,000	400 AGL	95 Takeoff	180	CLIMBING TO 5000 FT AGL
e	57,400	5,000 AGL	68 Cruise	240	
f	100,000	5,000 AGL	68 Cruise	240	
g	168,711	5,000 AGL	60 Cruise	220	8 NM Inbound
h	180,711	5,000 AGL	60 Cruise	140	6NM, Start Descent
i	198,711	2,000 AGL	60 Approach	165	3NM
j	210,711	300 AGL	68 Approach	125	1 NM from Threshold
k	216,711	50 AGL	68 Approach	125	Crossing the Threshold



Flight Profile C5TA

TACTICAL SPIRAL DEPARTURE TO 5000 AGL HIGH STRAIGHT-IN APPROACH

Flight Track: 15TCAa - TACTICAL SPIRAL DEPARTURE TO 5000 AGL HIGH STRAIGHT-IN APPROACH

Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000

Scale in Feet 1:306,000 (1 inch = 25,500 feet)

Flight Profile C5TC

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	11,000	400 AGL	95 Takeoff	180	CLIMBING TO 5000 FEET
e	21,000	1,000 AGL	95 Takeoff	220	
f	41,000	5,000 AGL	68 Cruise	240	
g	149,237	5,000 AGL	60 Cruise	240	5 NM Inbound
h	179,237	5,000 AGL	60 Cruise	140	Start Descent Pt
i	195,237	2,500 AGL	60 Cruise	160	Mid downwind of spiral
j	209,237	300 AGL	68 Approach	125	1 NM from Threshold
k	215,237	50 AGL	68 Approach	125	At the Threshold

Flight Profile C5TC

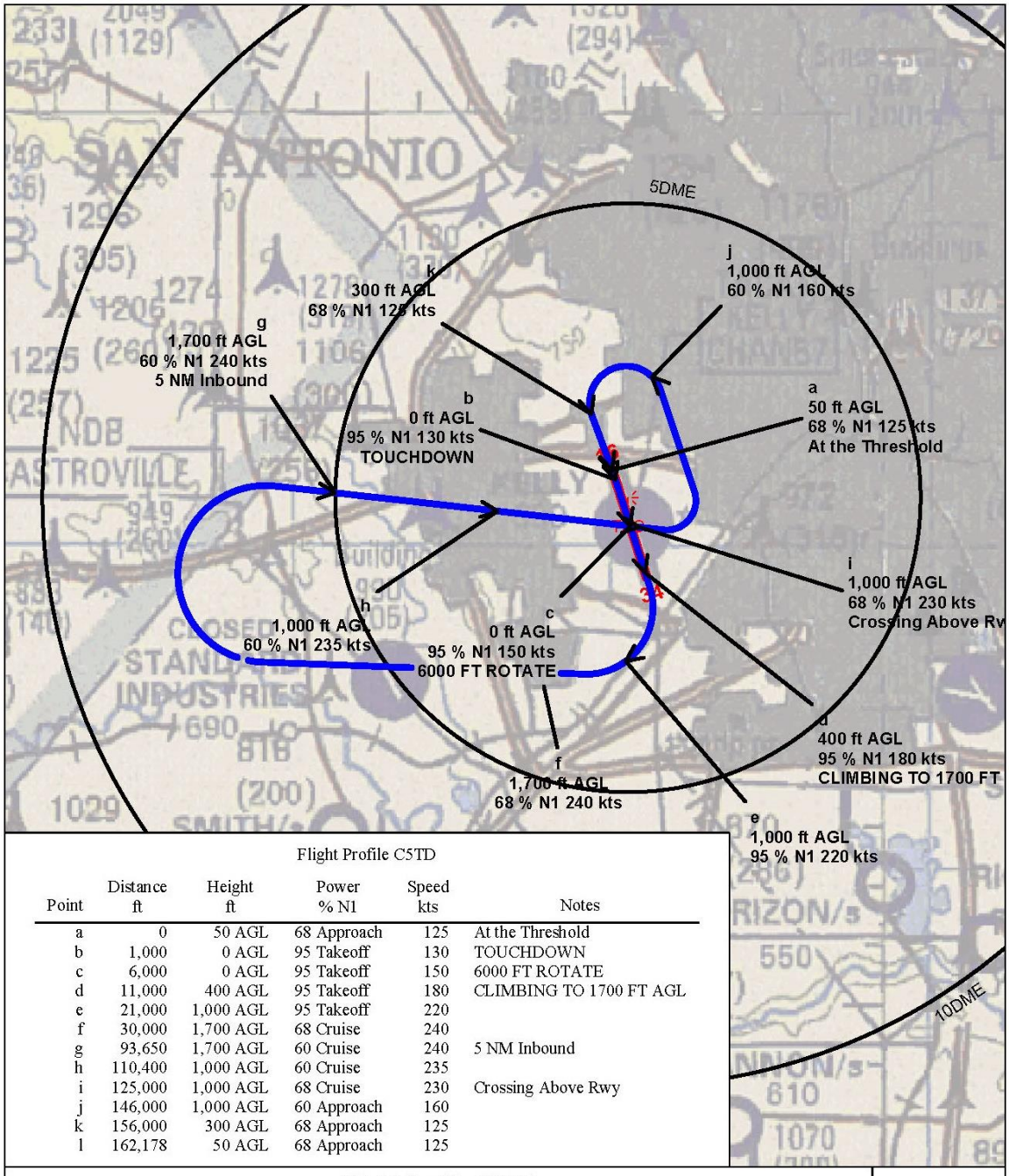
TACTICAL DEPARTURE TO 5000 AGL TO A RANDOM STEEP/SPIRAL DOWN APPROACH

Flight Track: 15TCBa - TACTICAL DEPARTURE TO 5000 AGL TO A RANDOM STEEP/SPIRAL DOWN APPROACH

Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:171,000 (1 inch = 14,200 feet)



Flight Profile C5TD

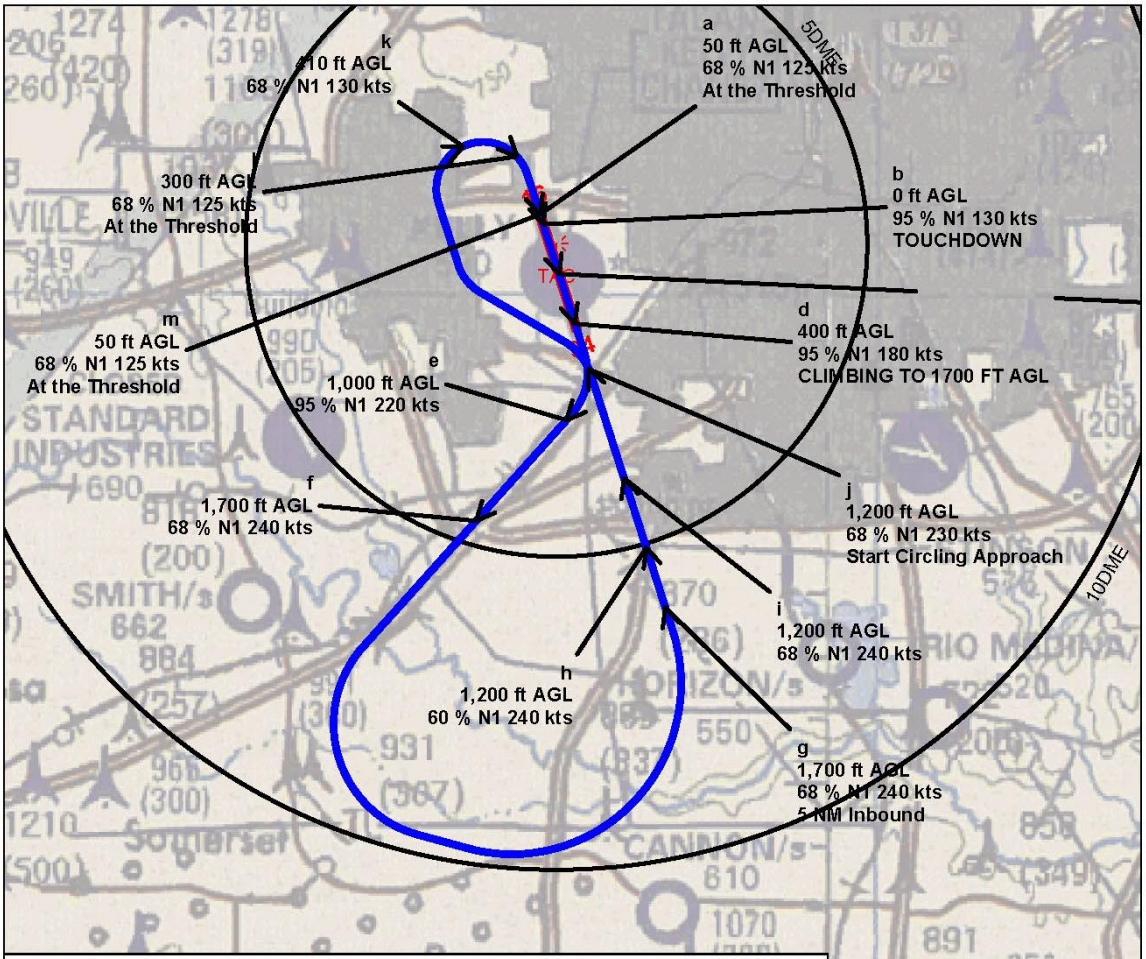
Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	11,000	400 AGL	95 Takeoff	180	CLIMBING TO 1700 FT AGL
e	21,000	1,000 AGL	95 Takeoff	220	
f	30,000	1,700 AGL	68 Cruise	240	
g	93,650	1,700 AGL	60 Cruise	240	5 NM Inbound
h	110,400	1,000 AGL	60 Cruise	235	
i	125,000	1,000 AGL	68 Cruise	230	Crossing Above Rwy
j	146,000	1,000 AGL	60 Approach	160	
k	156,000	300 AGL	68 Approach	125	
l	162,178	50 AGL	68 Approach	125	

Flight Profile C5TD

TACTICAL DEPARTURE TO 1700 AGL TO LOW ABEAM APPROACH
Flight Track: 15TCCa - TACTICAL DEPARTURE TO 1700 AGL TO LOW ABEAM APPROACH
Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:189,000 (1 inch = 15,800 feet)



Flight Profile C5TE

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	11,000	400 AGL	95 Takeoff	180	CLIMBING TO 1700 FT AGL
e	21,000	1,000 AGL	95 Takeoff	220	
f	34,000	1,700 AGL	68 Cruise	240	
g	115,239	1,700 AGL	68 Cruise	240	5 NM Inbound
h	121,239	1,200 AGL	60 Cruise	240	
i	128,239	1,200 AGL	68 Cruise	240	
j	139,239	1,200 AGL	68 Approach	230	Start Circling Approach
k	168,383	410 AGL	68 Approach	130	
l	174,034	300 AGL	68 Approach	125	At the Threshold
m	180,034	50 AGL	68 Approach	125	At the Threshold

Flight Profile C5TE

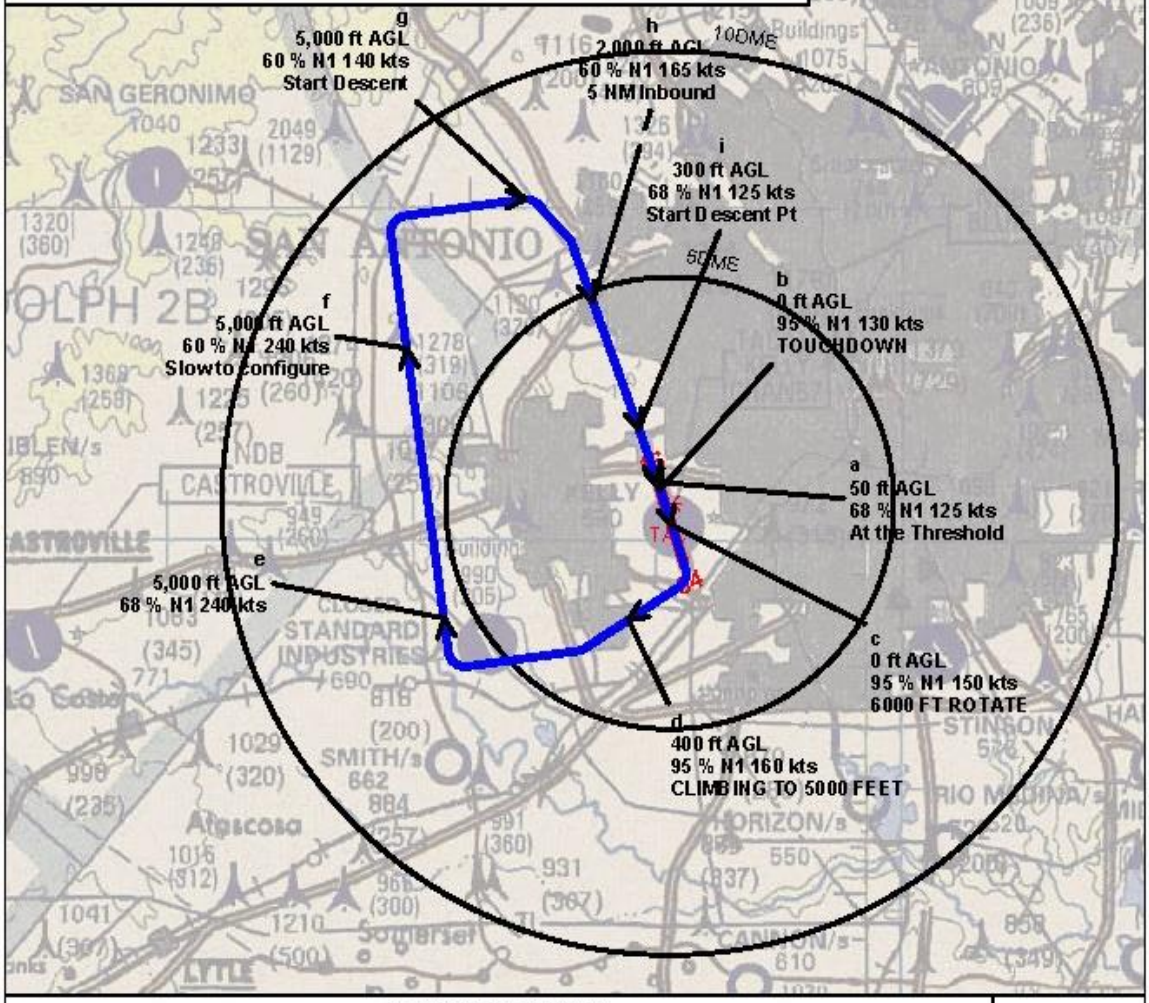
TACTICAL DEPARTURE TO 1700 AGL TO TEARDROP APPROACH
Flight Track: 15TCD - TACTICAL DEPARTURE TO TEARDROP APPROACH
Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:202,000 (1 inch = 16,900 feet)

Flight Profile C5TK

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	22,880	400 AGL	95 Takeoff	160	CLIMBING TO 5000 FEET
e	53,850	5,000 AGL	68 Cruise	240	
f	90,000	5,000 AGL	60 Cruise	240	Slow to configure
g	125,000	5,000 AGL	60 Approach	140	Start Descent
h	142,000	2,000 AGL	60 Approach	165	5 NM Inbound
i	160,000	300 AGL	68 Approach	125	Start Descent Pt
j	167,503	50 AGL	68 Approach	125	At the Threshold



Flight Profile C5TK

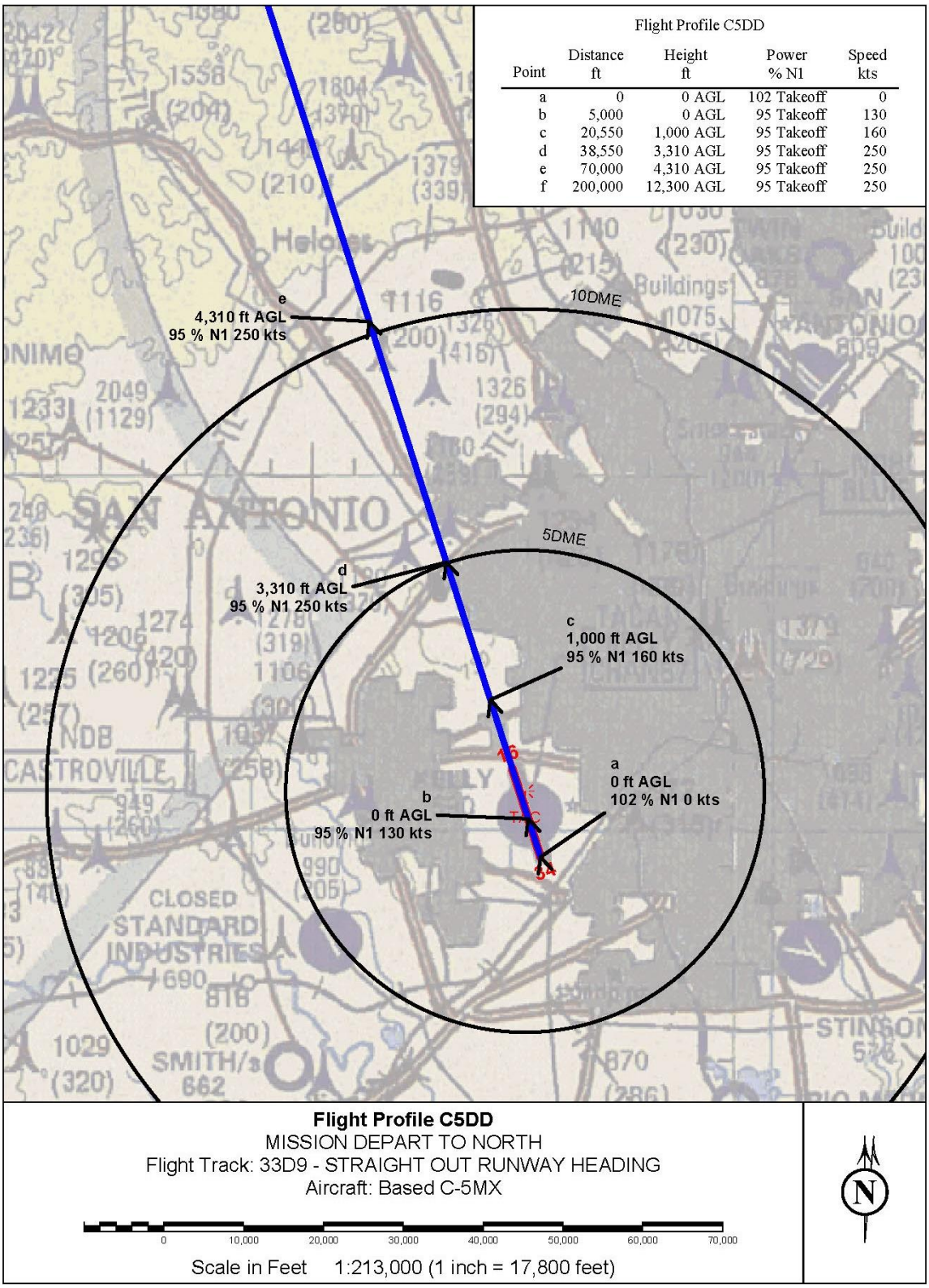
TACTICAL DEPARTURE TO CURVILINEAR APPROACH TO RWY 15

Flight Track: 15TCFa - TACTICAL DEPARTURE TO CURVILINEAR APPROACH TO RWY 33

Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000

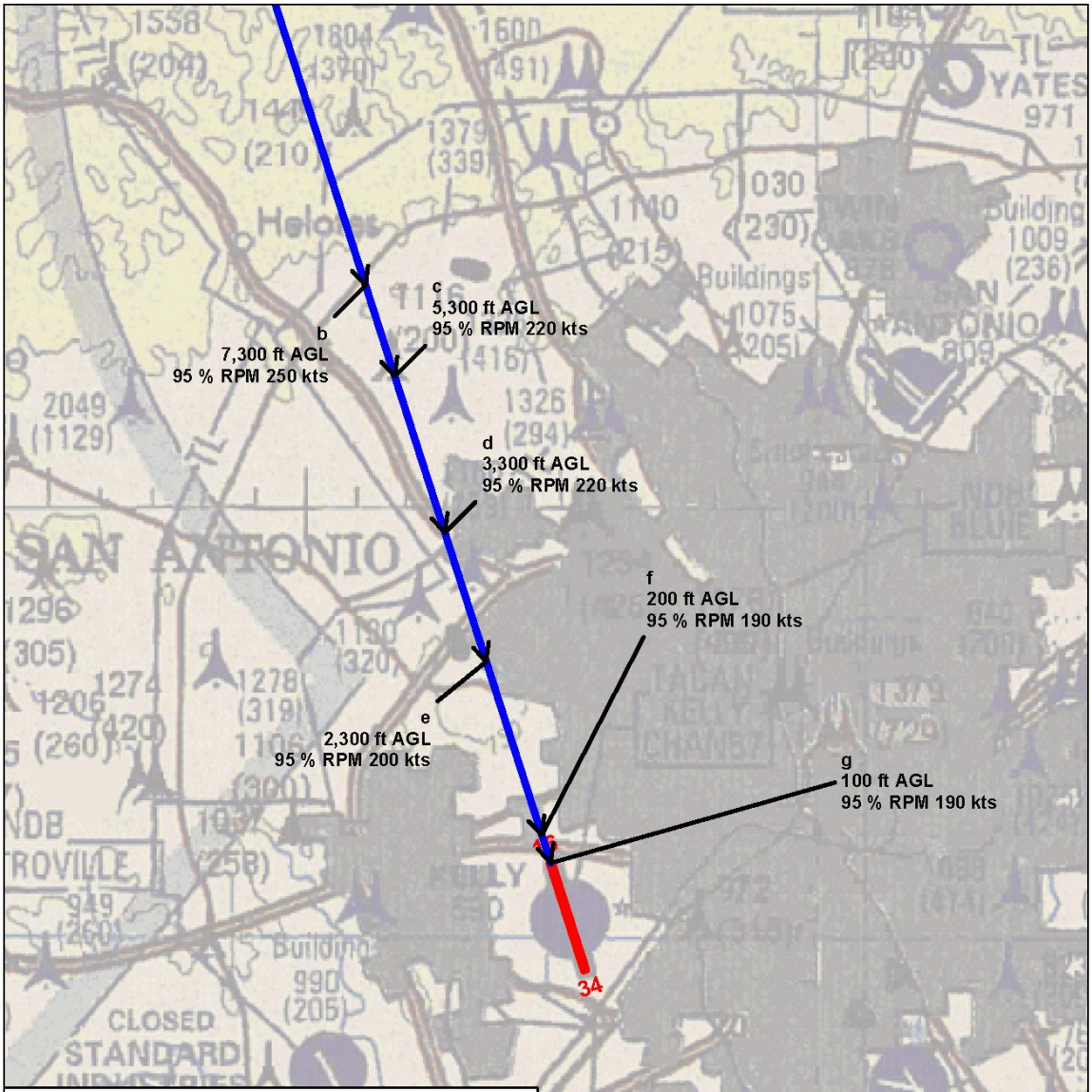
Scale in Feet 1:282,000 (1 inch = 23,500 feet)



Flight Profile C5DD
MISSION DEPART TO NORTH
Flight Track: 33D9 - STRAIGHT OUT RUNWAY HEADING
Aircraft: Based C-5MX

B.2.3.2 Contract ADAIR Aircraft Representative Flight Profiles

Contract ADAIR High Noise A-4N (A-4C Surrogate)



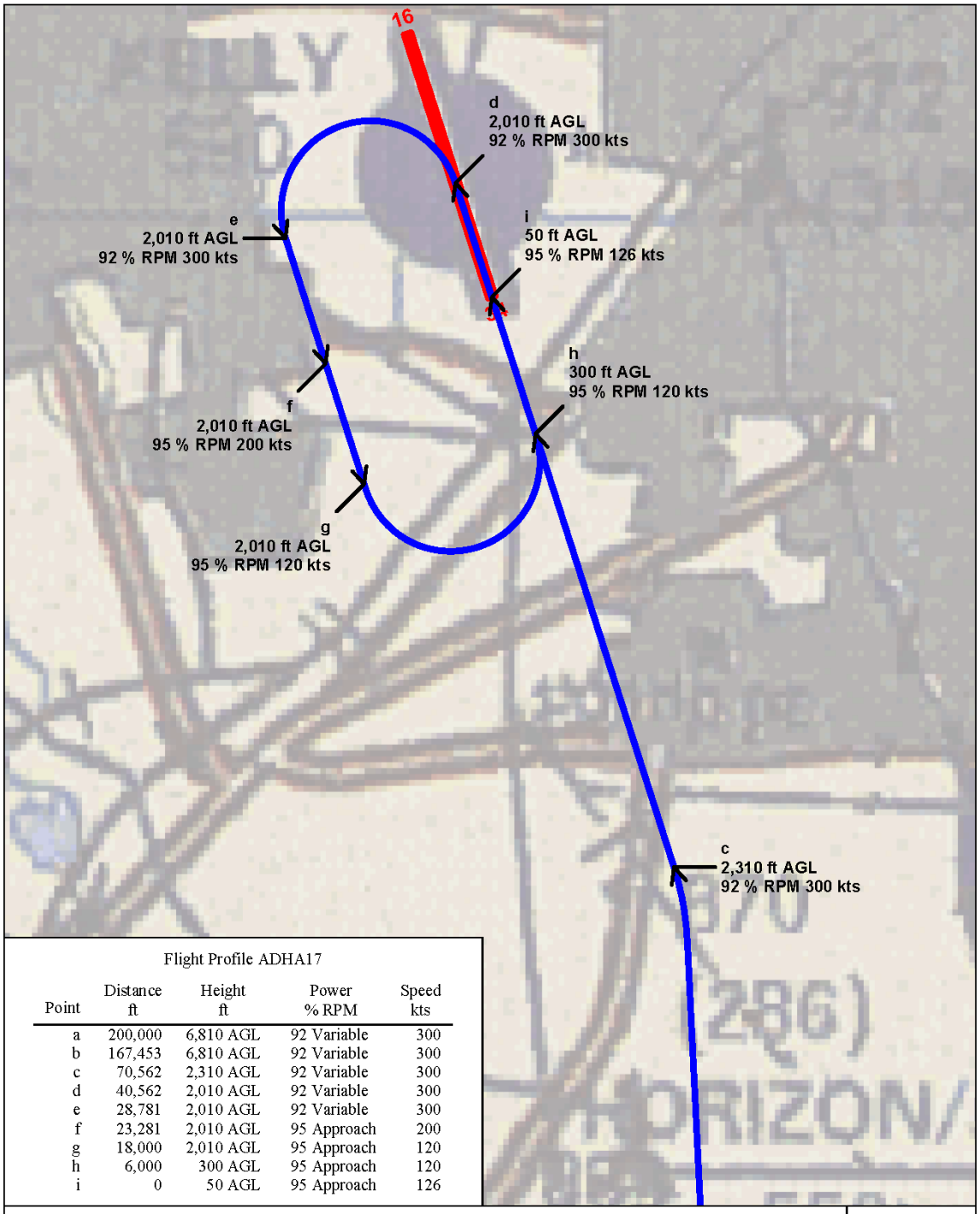
Flight Profile ADHA03

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	9,300 AGL	95 Approach	300
b	62,260	7,300 AGL	95 Approach	250
c	52,460	5,300 AGL	95 Approach	220
d	35,600	3,300 AGL	95 Approach	220
e	21,700	2,300 AGL	95 Approach	200
f	3,000	200 AGL	95 Approach	190
g	0	100 AGL	95 Approach	190

Flight Profile ADHA03
STRAIGHT IN SFO FROM NORTH - REPRESENTATIVE

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:207,000 (1 inch = 17,200 feet)



Flight Profile ADHA17

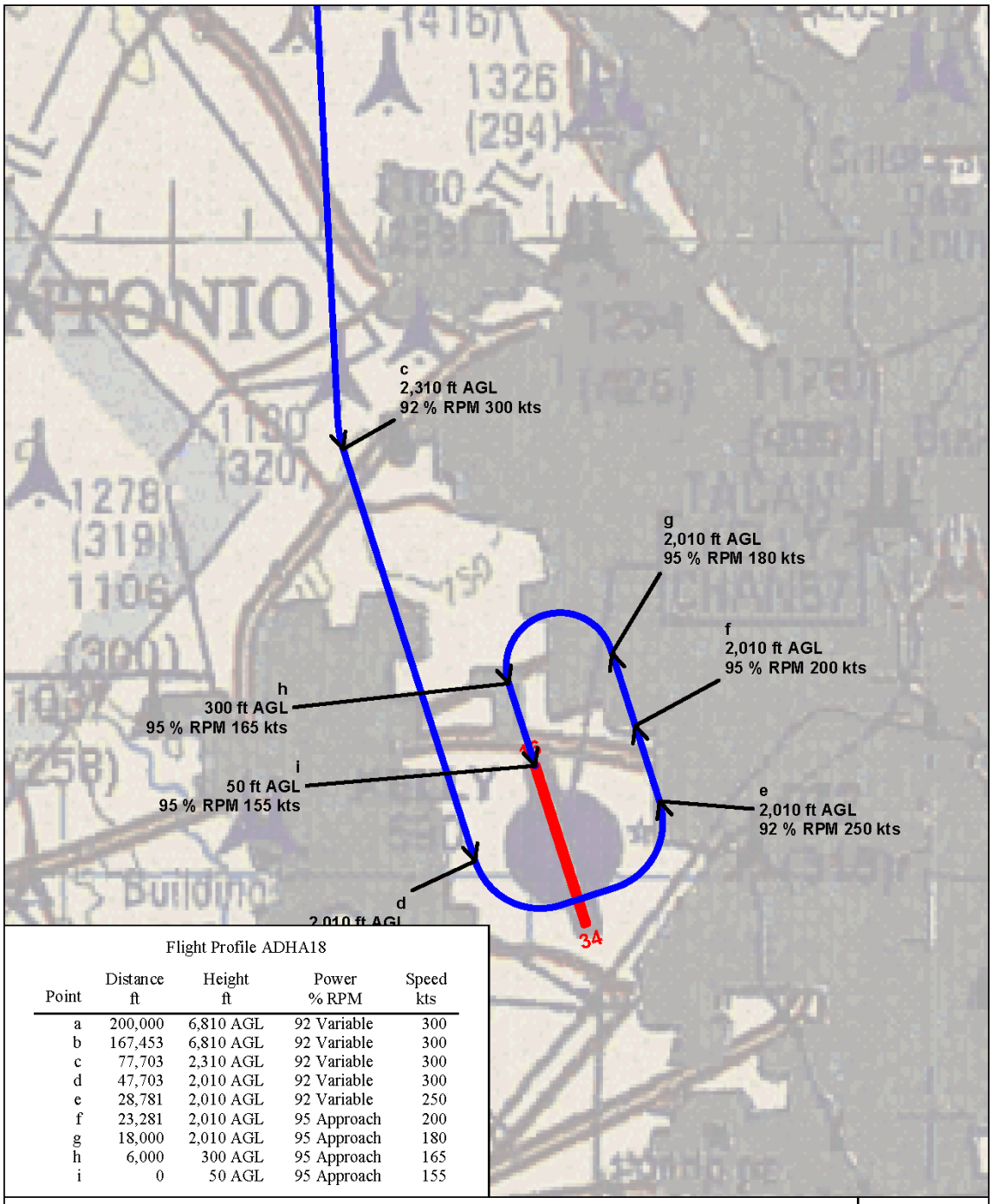
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	92 Variable	300
b	167,453	6,810 AGL	92 Variable	300
c	70,562	2,310 AGL	92 Variable	300
d	40,562	2,010 AGL	92 Variable	300
e	28,781	2,010 AGL	92 Variable	300
f	23,281	2,010 AGL	95 Approach	200
g	18,000	2,010 AGL	95 Approach	120
h	6,000	300 AGL	95 Approach	120
i	0	50 AGL	95 Approach	126

Flight Profile ADHA17

ADAIR Type A High Noise - OH Break Arrival - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:75,300 (1 inch = 6,280 feet)



Flight Profile ADHA18

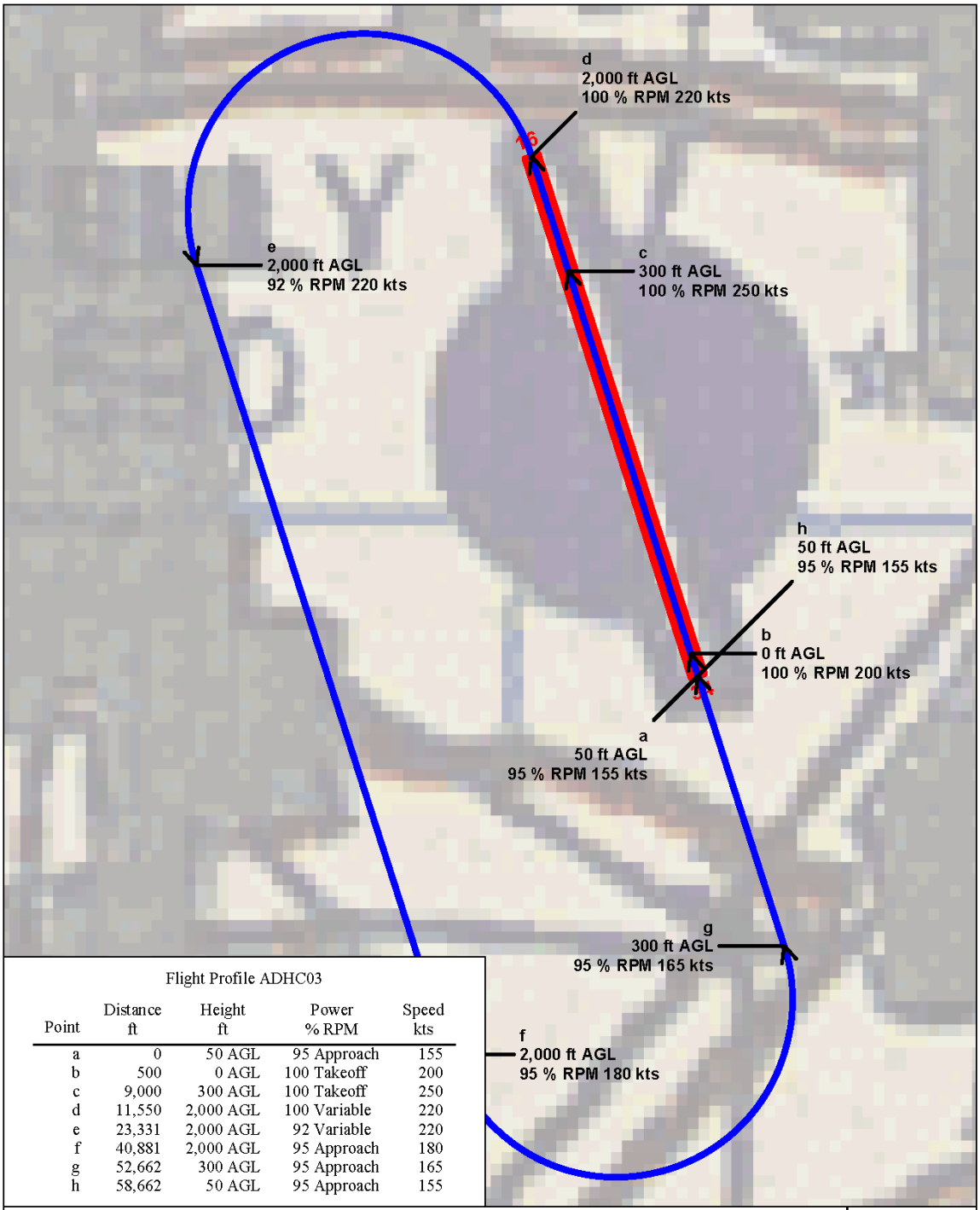
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	92 Variable	300
b	167,453	6,810 AGL	92 Variable	300
c	77,703	2,310 AGL	92 Variable	300
d	47,703	2,010 AGL	92 Variable	300
e	28,781	2,010 AGL	92 Variable	250
f	23,281	2,010 AGL	95 Approach	200
g	18,000	2,010 AGL	95 Approach	180
h	6,000	300 AGL	95 Approach	165
i	0	50 AGL	95 Approach	155

Flight Profile ADHA18

ADAIR Type A High Noise -TACTICAL PITCH TO EAST FROM NORTH - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:127,000 (1 inch = 10,600 feet)



Flight Profile ADHC03

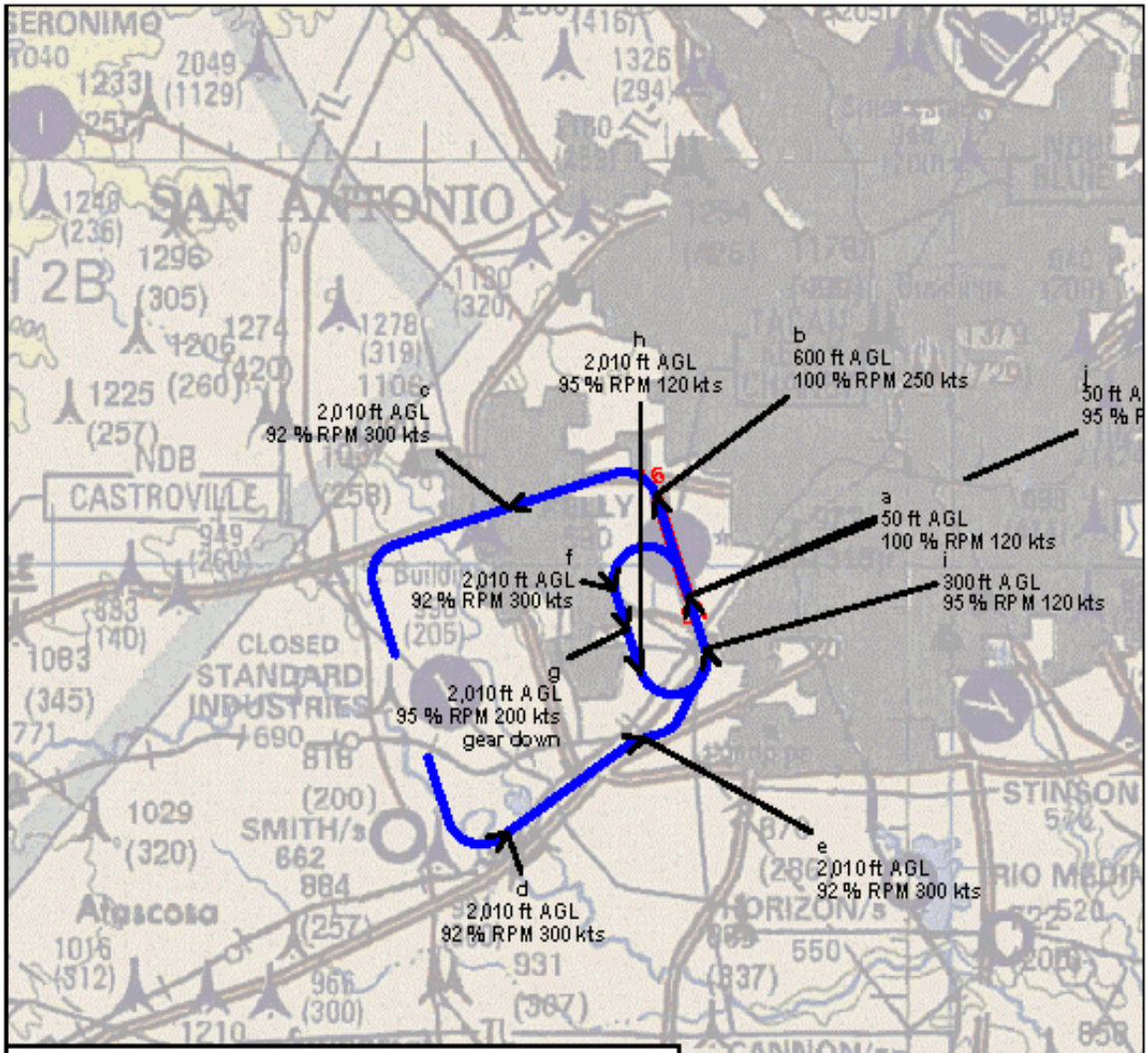
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	50 AGL	95 Approach	155
b	500	0 AGL	100 Takeoff	200
c	9,000	300 AGL	100 Takeoff	250
d	11,550	2,000 AGL	100 Variable	220
e	23,331	2,000 AGL	92 Variable	220
f	40,881	2,000 AGL	95 Approach	180
g	52,662	300 AGL	95 Approach	165
h	58,662	50 AGL	95 Approach	155

Flight Profile ADHC03

ADAIR Type A High Noise - Closed Pattern - Touch and Go - REPRESENTATIVE

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:38,200 (1 inch = 3,180 feet)



Flight Profile ADHC04

Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	50 AGL	100 Takeoff	120	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	92 Variable	300	
d	82,835	2,010 AGL	92 Variable	300	
e	101,087	2,010 AGL	92 Variable	300	
f	134,415	2,010 AGL	92 Variable	300	
g	139,000	2,010 AGL	95 Approach	200	gear down
h	143,895	2,010 AGL	95 Approach	120	
i	155,433	300 AGL	95 Approach	120	
j	161,433	50 AGL	95 Approach	126	

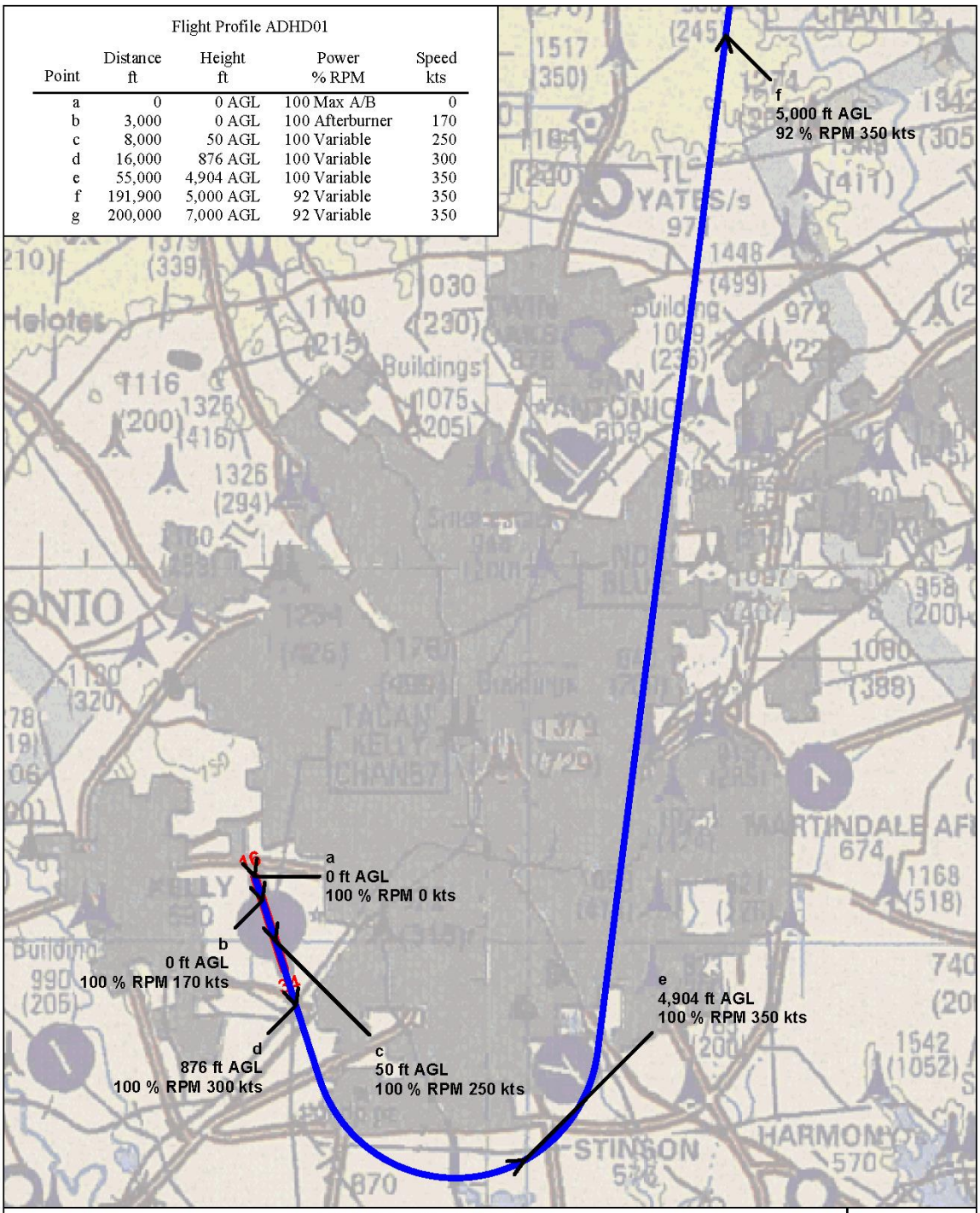
Flight Profile ADHC04

ADAIR Type A High Noise - Closed Pattern - REENTRY TO PITCH - REPRESENTATIVE

Scale in Feet 1:230,000 (1 inch = 19,100 feet)

Flight Profile ADHD01

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	100 Max A/B	0
b	3,000	0 AGL	100 Afterburner	170
c	8,000	50 AGL	100 Variable	250
d	16,000	876 AGL	100 Variable	300
e	55,000	4,904 AGL	100 Variable	350
f	191,900	5,000 AGL	92 Variable	350
g	200,000	7,000 AGL	92 Variable	350



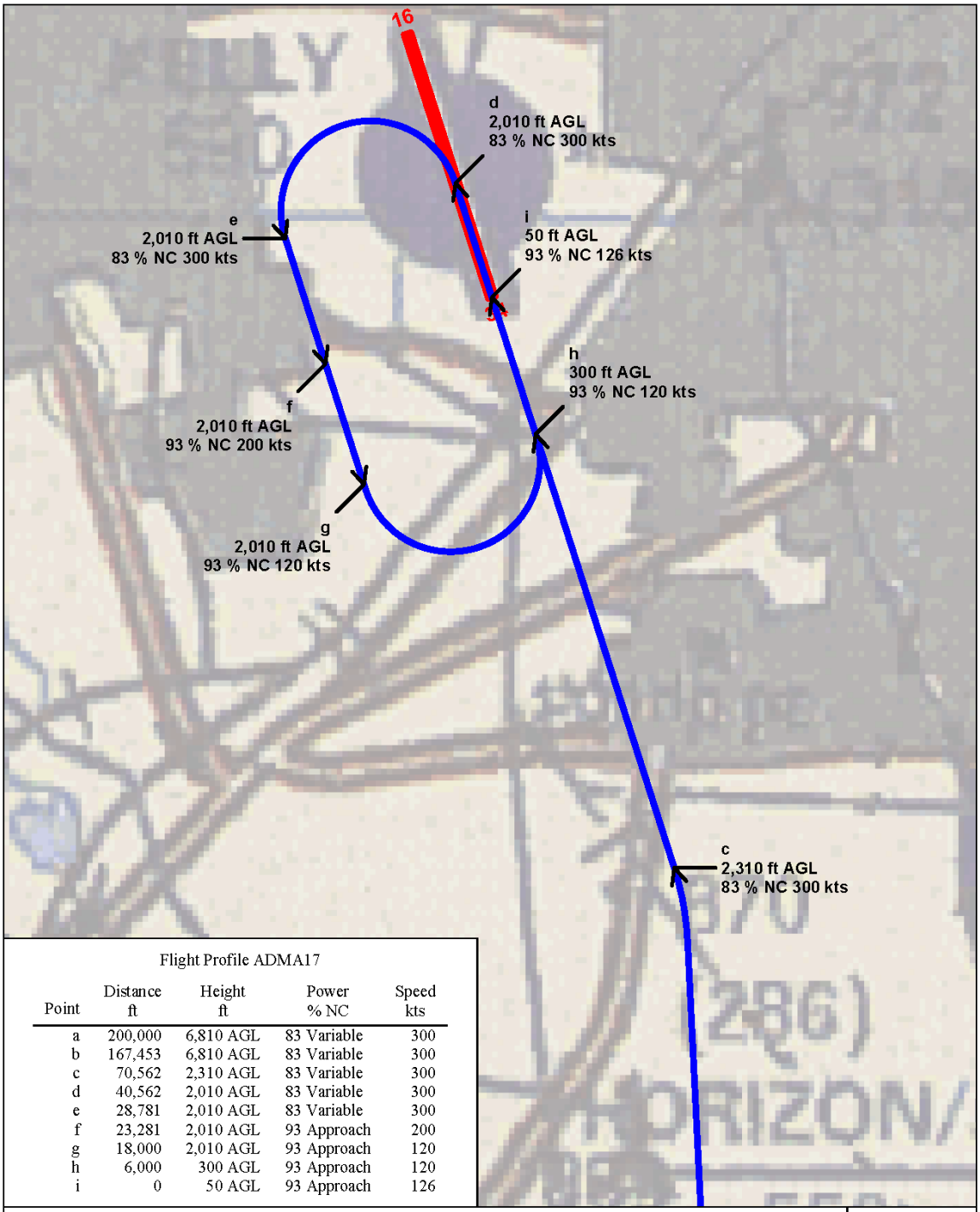
Flight Profile ADHD01

ADAIR Type A High Noise - Departure - REPRESENTATIVE

Scale in Feet 1:213,000 (1 inch = 17,700 feet)

Contract ADAIR Medium Noise MiG-21 (F-104D&G Surrogate)

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	15,000 AGL	83 Cruise	250
b	75,000	4,500 AGL	83 Cruise	150
c	28,000	2,500 AGL	93 Approach	150
d	9,000	1,200 AGL	93 Approach	115
e	0	50 AGL	93 Approach	115



Flight Profile ADMA17

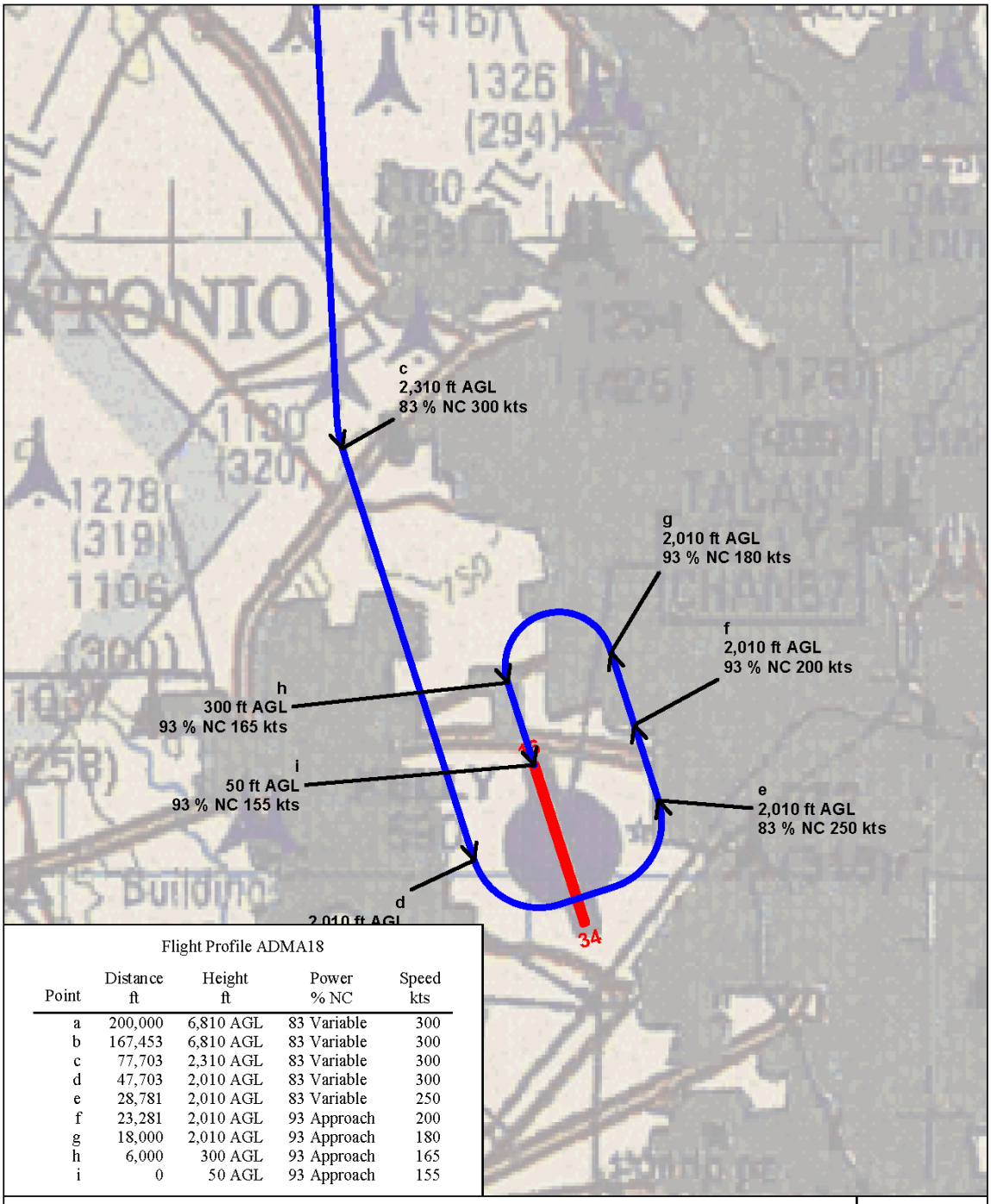
Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	83 Variable	300
b	167,453	6,810 AGL	83 Variable	300
c	70,562	2,310 AGL	83 Variable	300
d	40,562	2,010 AGL	83 Variable	300
e	28,781	2,010 AGL	83 Variable	300
f	23,281	2,010 AGL	93 Approach	200
g	18,000	2,010 AGL	93 Approach	120
h	6,000	300 AGL	93 Approach	120
i	0	50 AGL	93 Approach	126

Flight Profile ADMA17

ADAIR Type A Med Noise - OH Break Arrival - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:75,300 (1 inch = 6,280 feet)



Flight Profile ADMA18

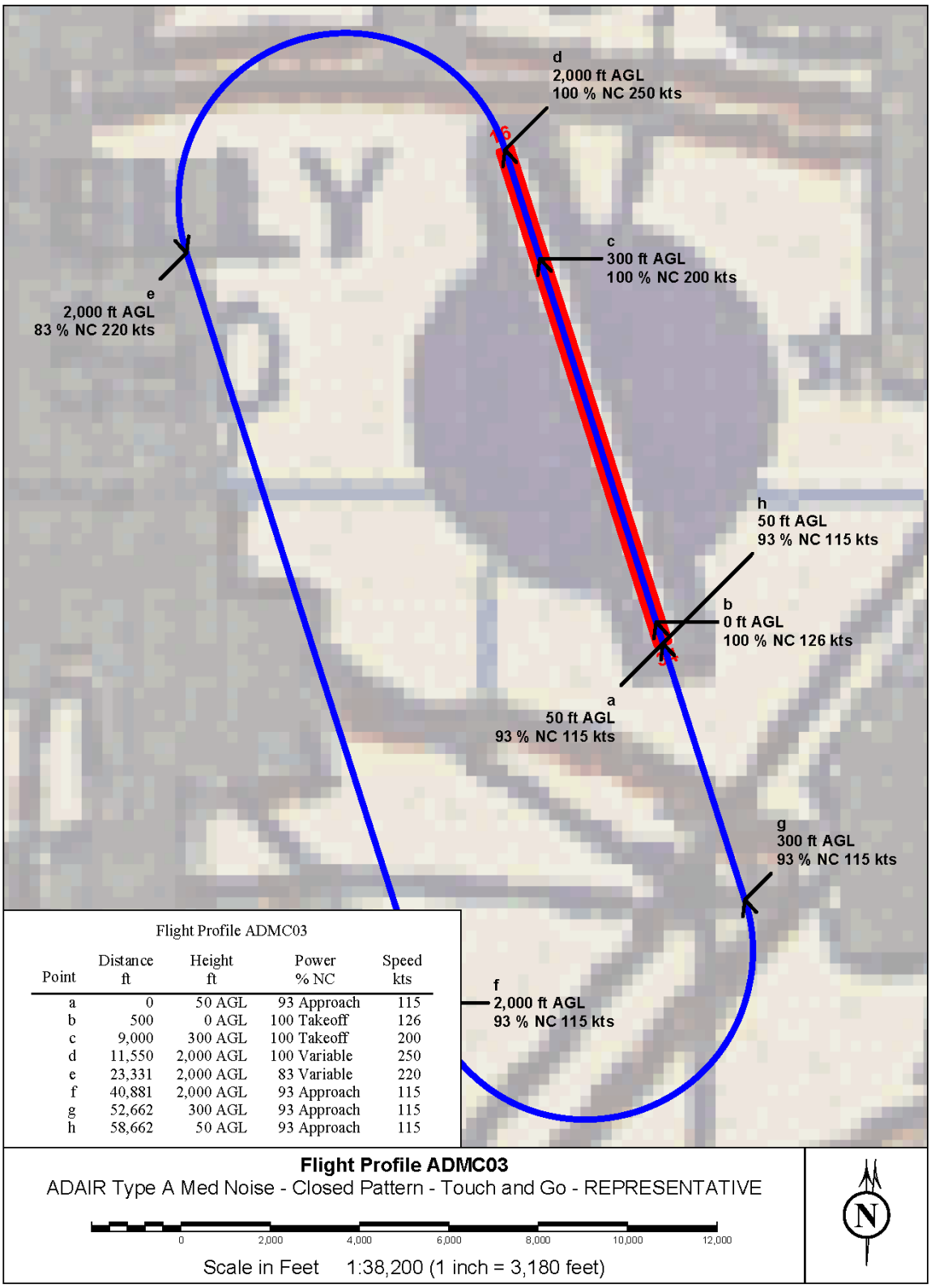
Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	83 Variable	300
b	167,453	6,810 AGL	83 Variable	300
c	77,703	2,310 AGL	83 Variable	300
d	47,703	2,010 AGL	83 Variable	300
e	28,781	2,010 AGL	83 Variable	250
f	23,281	2,010 AGL	93 Approach	200
g	18,000	2,010 AGL	93 Approach	180
h	6,000	300 AGL	93 Approach	165
i	0	50 AGL	93 Approach	155

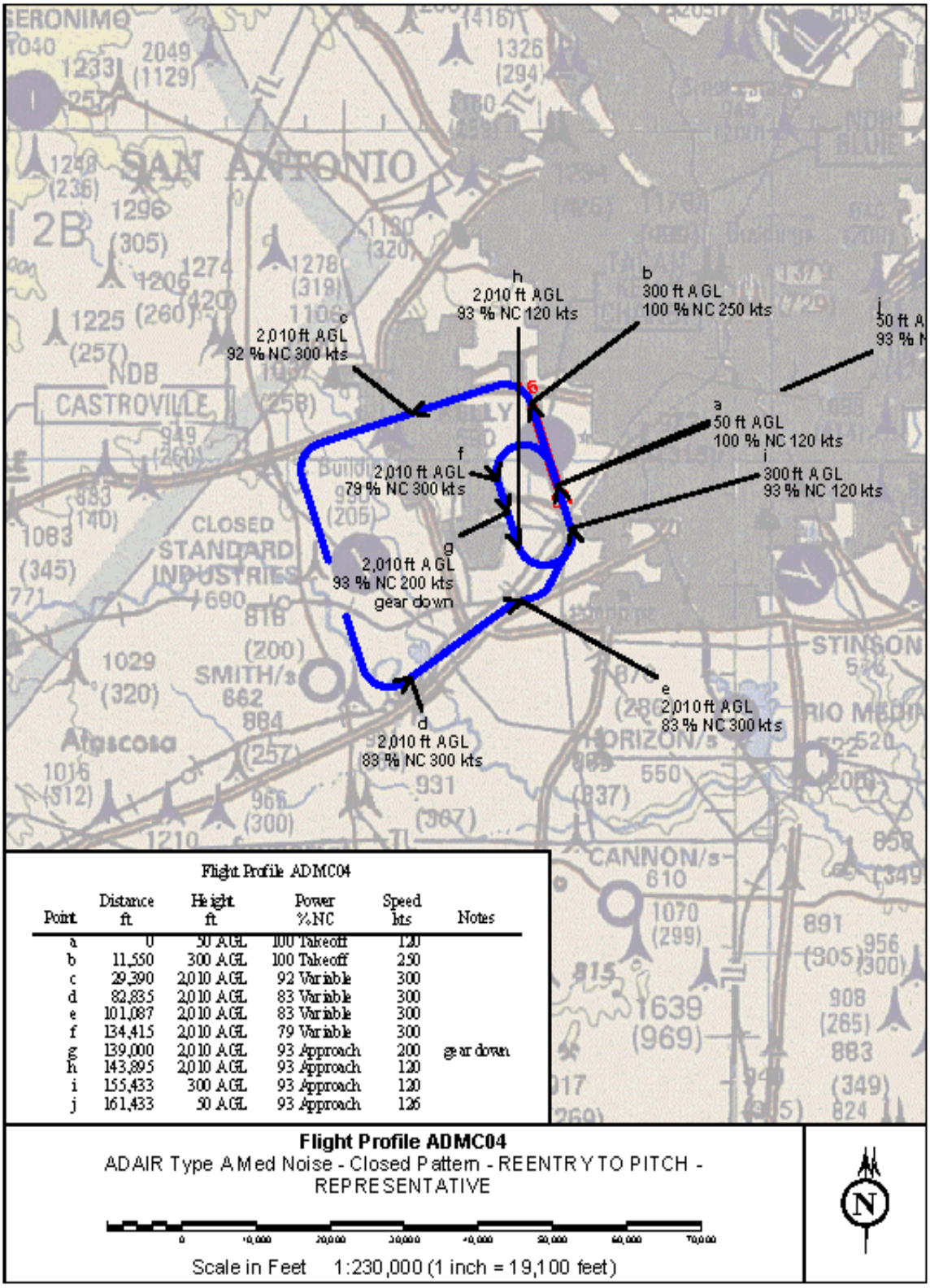
Flight Profile ADMA18

ADAIR Type A Med Noise -TACTICAL PITCH TO EAST FROM NORTH - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:127,000 (1 inch = 10,600 feet)


d
2,000 ft AGL
100 % NC 250 kts
c
300 ft AGL
100 % NC 200 kts
e
2,000 ft AGL
83 % NC 220 kts
h
50 ft AGL
93 % NC 115 kts
b
0 ft AGL
100 % NC 126 kts
a
50 ft AGL
93 % NC 115 kts
g
300 ft AGL
93 % NC 115 kts
f
2,000 ft AGL
93 % NC 115 kts
Flight Profile ADMC03
Point | Distance ft | Height ft | Power % NC | Speed kts
a | 0 | 50 AGL | 93 Approach | 115
b | 500 | 0 AGL | 100 Takeoff | 126
c | 9,000 | 300 AGL | 100 Takeoff | 200
d | 11,550 | 2,000 AGL | 100 Variable | 250
e | 23,331 | 2,000 AGL | 83 Variable | 220
f | 40,881 | 2,000 AGL | 93 Approach | 115
g | 52,662 | 300 AGL | 93 Approach | 115
h | 58,662 | 50 AGL | 93 Approach | 115
Flight Profile ADMC03
ADAIR Type A Med Noise - Closed Pattern - Touch and Go - REPRESENTATIVE
0
2,000
4,000
6,000
8,000
10,000
12,000
Scale in Feet 1:38,200 (1 inch = 3,180 feet)
N



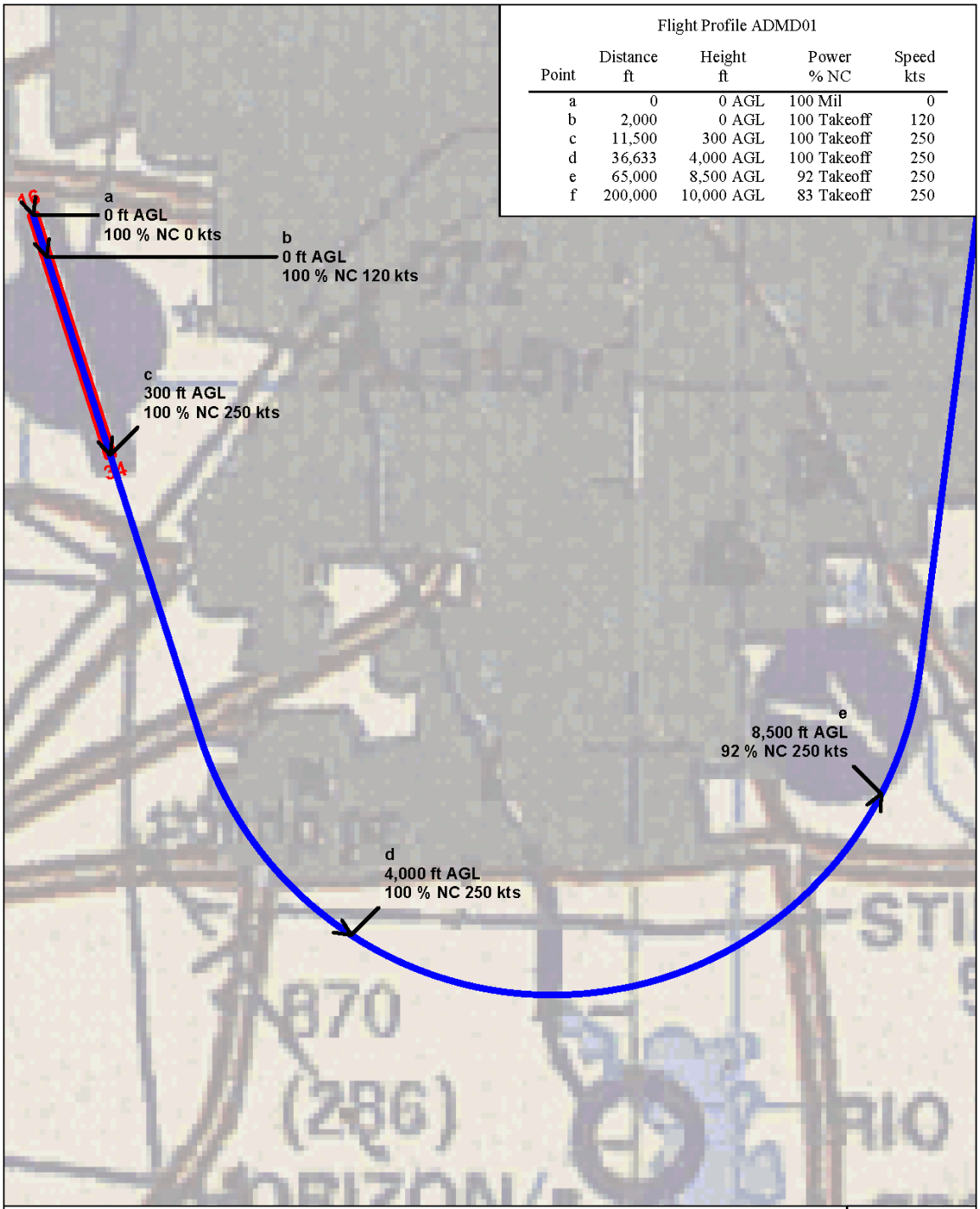
Flight Profile ADMC04

Point	Distance ft	Height ft	Power %NC	Speed kts	Notes
a	0	50 AGL	100 Takeoff	120	
b	11,550	300 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	92 Variable	300	
d	82,835	2,010 AGL	83 Variable	300	
e	101,087	2,010 AGL	83 Variable	300	
f	134,415	2,010 AGL	79 Variable	300	
g	139,000	2,010 AGL	93 Approach	200	gear down
h	143,895	2,010 AGL	93 Approach	120	
i	155,433	300 AGL	93 Approach	120	
j	161,433	50 AGL	93 Approach	126	

Flight Profile ADMC04

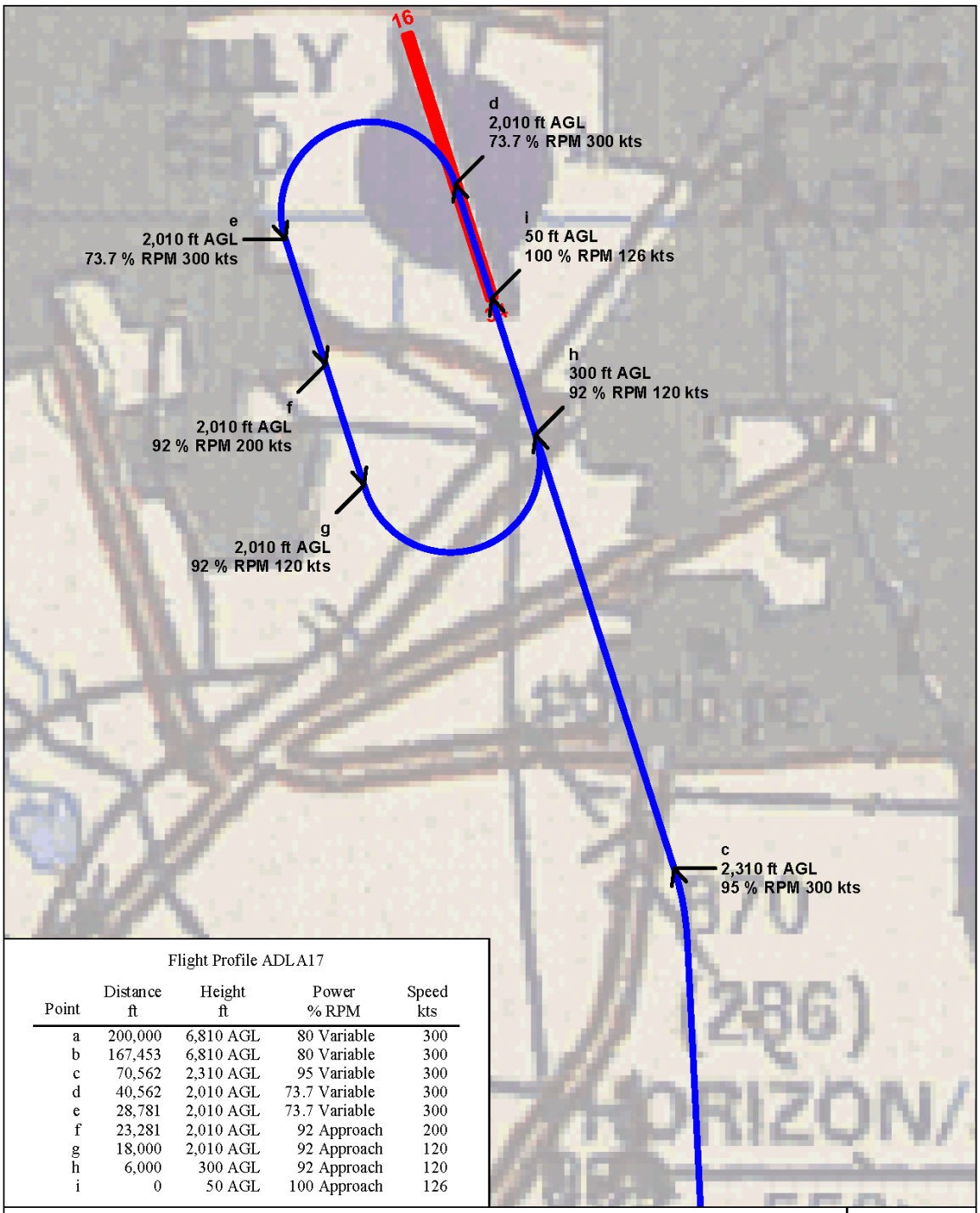
ADAIR Type A Med Noise - Closed Pattern - REENTRY TO PITCH - REPRESENTATIVE

Scale in Feet 1:230,000 (1 inch = 19,100 feet)


Flight Profile ADMD01
Point | Distance ft | Height ft | Power % NC | Speed kts
a | 0 | 0 AGL | 100 Mil | 0
b | 2,000 | 0 AGL | 100 Takeoff | 120
c | 11,500 | 300 AGL | 100 Takeoff | 250
d | 36,633 | 4,000 AGL | 100 Takeoff | 250
e | 65,000 | 8,500 AGL | 92 Takeoff | 250
f | 200,000 | 10,000 AGL | 83 Takeoff | 250
16
a
0 ft AGL
100 % NC 0 kts
b
0 ft AGL
100 % NC 120 kts
c
300 ft AGL
100 % NC 250 kts
34
e
8,500 ft AGL
92 % NC 250 kts
d
4,000 ft AGL
100 % NC 250 kts
Flight Profile ADMD01
ADAIR Type A Med Noise - Departure - REPRESENTATIVE
0
4,000
8,000
12,000
16,000
20,000
24,000
Scale in Feet 1:82,300 (1 inch = 6,860 feet)
N

Contract ADAIR Low Noise L-59 (T-45 Surrogate)

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	15,000 AGL	89.3 Cruise	250
b	75,000	4,500 AGL	89.3 Cruise	150
c	28,000	2,500 AGL	95 Approach	150
d	9,000	1,200 AGL	95 Approach	115
e	0	50 AGL	95 Approach	115



Flight Profile ADLA17

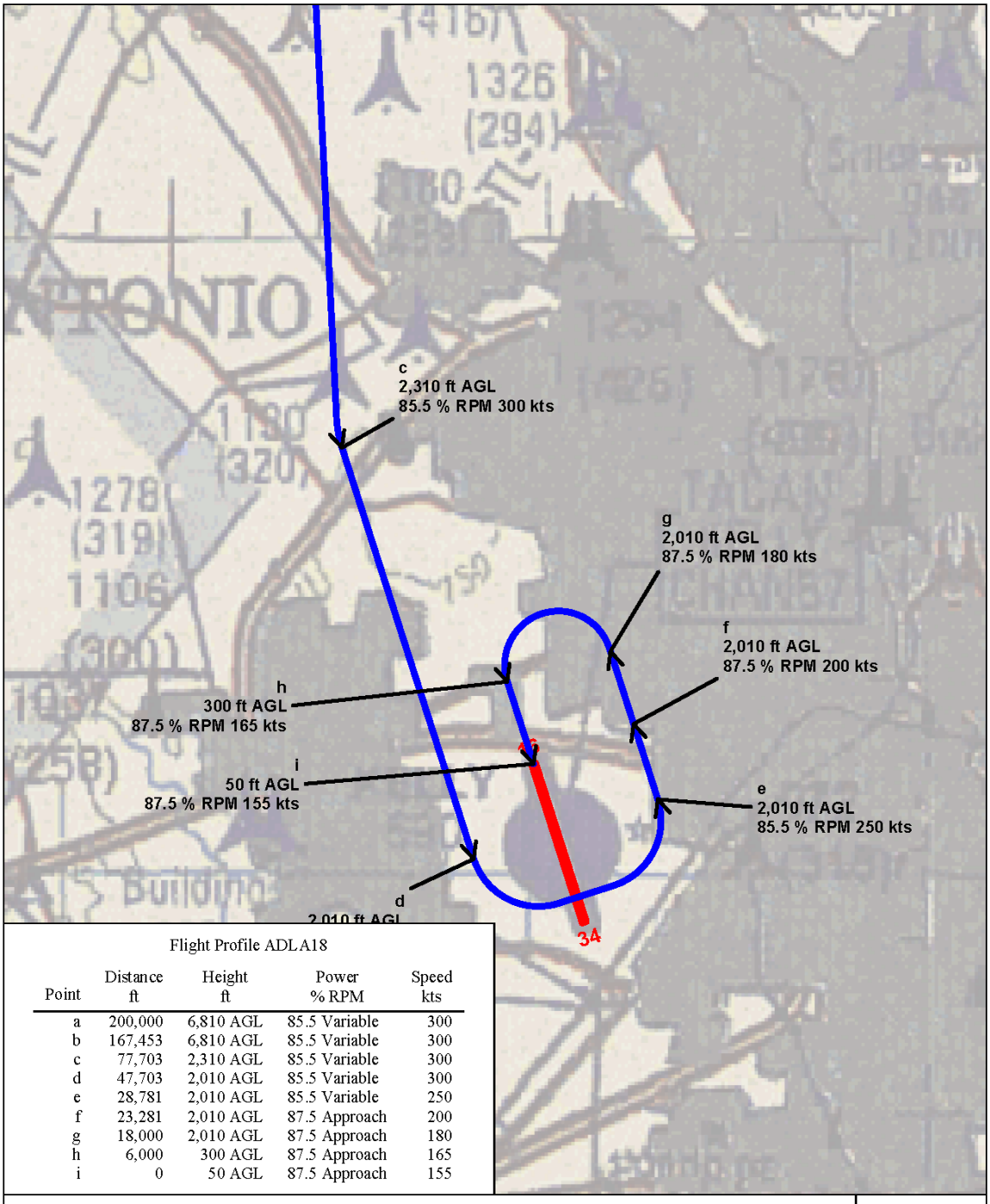
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	80 Variable	300
b	167,453	6,810 AGL	80 Variable	300
c	70,562	2,310 AGL	95 Variable	300
d	40,562	2,010 AGL	73.7 Variable	300
e	28,781	2,010 AGL	73.7 Variable	300
f	23,281	2,010 AGL	92 Approach	200
g	18,000	2,010 AGL	92 Approach	120
h	6,000	300 AGL	92 Approach	120
i	0	50 AGL	100 Approach	126

Flight Profile ADLA17

ADAIR Type A Low Noise - OH Break Arrival - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:75,300 (1 inch = 6,280 feet)



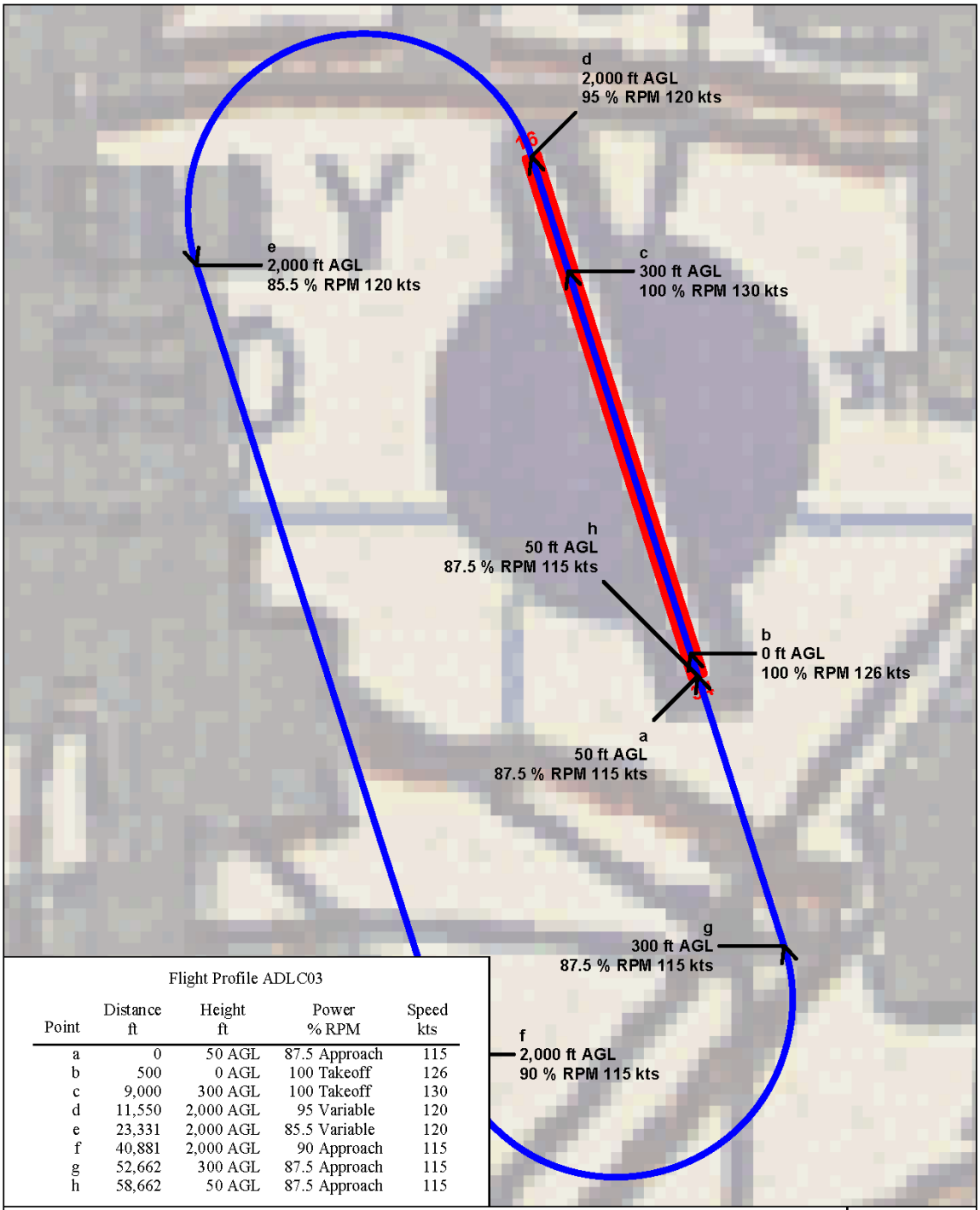
Flight Profile ADLA18

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	85.5 Variable	300
b	167,453	6,810 AGL	85.5 Variable	300
c	77,703	2,310 AGL	85.5 Variable	300
d	47,703	2,010 AGL	85.5 Variable	300
e	28,781	2,010 AGL	85.5 Variable	250
f	23,281	2,010 AGL	87.5 Approach	200
g	18,000	2,010 AGL	87.5 Approach	180
h	6,000	300 AGL	87.5 Approach	165
i	0	50 AGL	87.5 Approach	155

Flight Profile ADLA18

ADAIR Type A Low Noise -TACTICAL PITCH TO EAST FROM NORTH - REPRESENTATIVE

Scale in Feet 1:127,000 (1 inch = 10,600 feet)



Flight Profile ADLC03

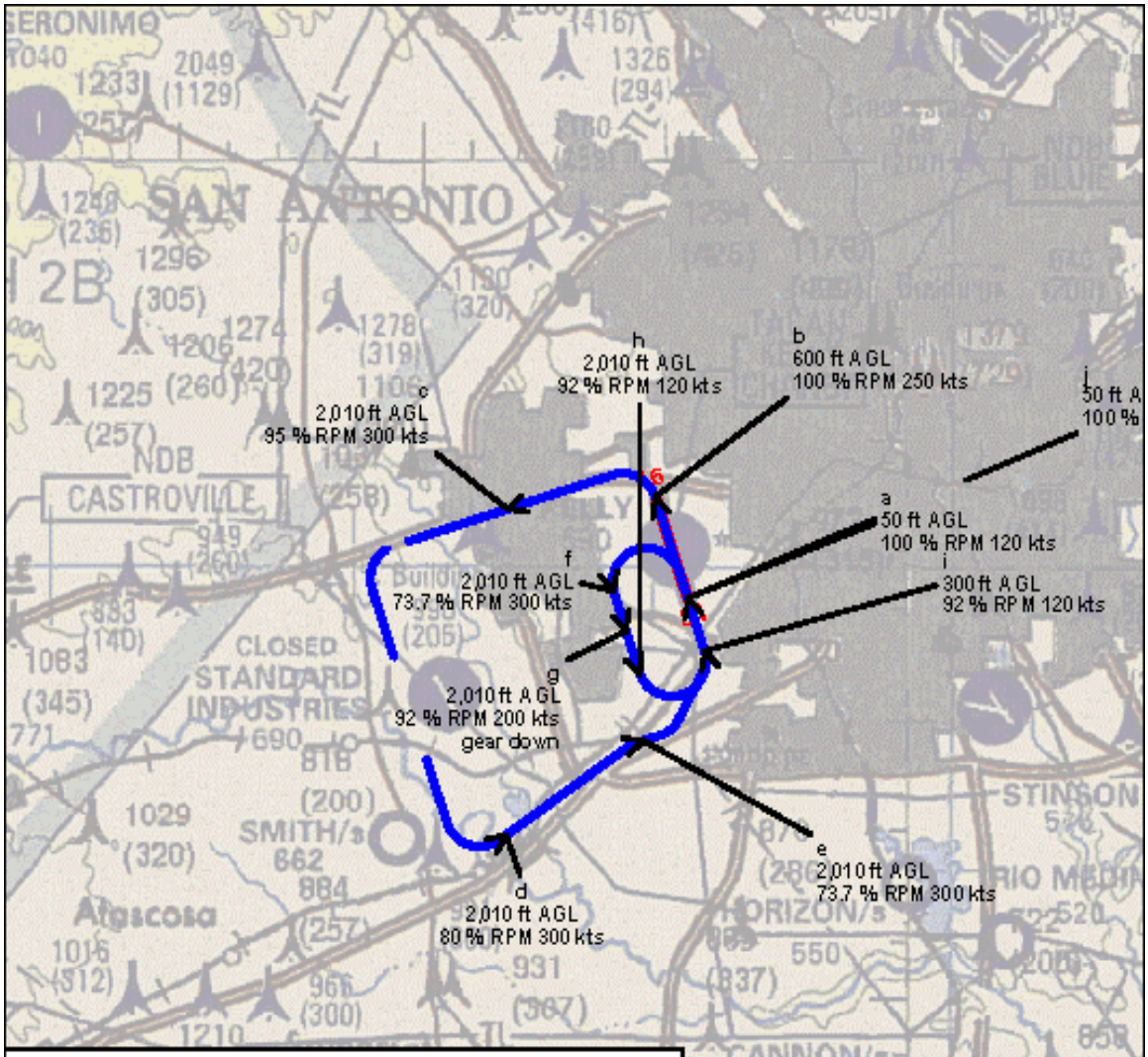
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	50 AGL	87.5 Approach	115
b	500	0 AGL	100 Takeoff	126
c	9,000	300 AGL	100 Takeoff	130
d	11,550	2,000 AGL	95 Variable	120
e	23,331	2,000 AGL	85.5 Variable	120
f	40,881	2,000 AGL	90 Approach	115
g	52,662	300 AGL	87.5 Approach	115
h	58,662	50 AGL	87.5 Approach	115

Flight Profile ADLC03

ADAIR Type A Low Noise - Closed Pattern - Touch and Go - REPRESENTATIVE

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:38,200 (1 inch = 3,180 feet)



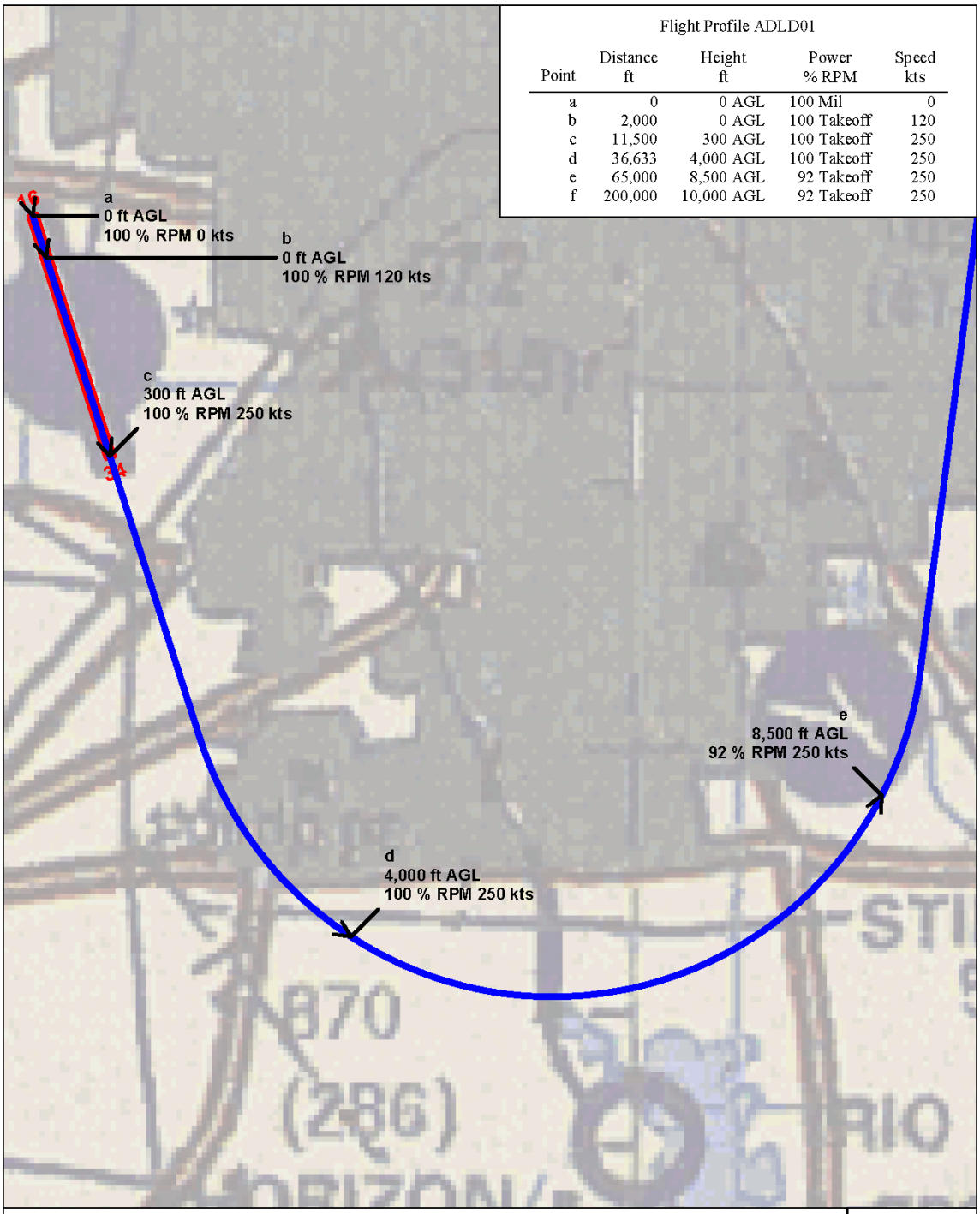
Flight Profile ADLC04

Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	50 AGL	100 Takeoff	120	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	95 Variable	300	
d	82,835	2,010 AGL	80 Variable	300	
e	101,087	2,010 AGL	73.7 Variable	300	
f	134,415	2,010 AGL	73.7 Variable	300	
g	139,000	2,010 AGL	92 Approach	200	gear down
h	143,895	2,010 AGL	92 Approach	120	
i	155,433	300 AGL	92 Approach	120	
j	161,433	50 AGL	100 Approach	126	

Flight Profile ADLC04

AD AIR Type A LowNoise - Closed Pattern - REENTRY TO PITCH - REPRESENTATIVE

Scale in Feet 1:230,000 (1 inch = 19,100 feet)


Flight Profile ADLD01
Point | Distance ft | Height ft | Power % RPM | Speed kts
a | 0 | 0 AGL | 100 Mil | 0
b | 2,000 | 0 AGL | 100 Takeoff | 120
c | 11,500 | 300 AGL | 100 Takeoff | 250
d | 36,633 | 4,000 AGL | 100 Takeoff | 250
e | 65,000 | 8,500 AGL | 92 Takeoff | 250
f | 200,000 | 10,000 AGL | 92 Takeoff | 250
16
a
0 ft AGL
100 % RPM 0 kts
b
0 ft AGL
100 % RPM 120 kts
c
300 ft AGL
100 % RPM 250 kts
34
e
8,500 ft AGL
92 % RPM 250 kts
d
4,000 ft AGL
100 % RPM 250 kts
Flight Profile ADLD01
ADAIR Type A Low Noise - Departure - REPRESENTATIVE
0
4,000
8,000
12,000
16,000
20,000
24,000
Scale in Feet 1:82,300 (1 inch = 6,860 feet)
N

B.2.4 Ground/Maintenance Run-ups

This section details the number, type, and duration of the ground and maintenance engine run-up operations at the airfield. Because the contract ADAIR aircraft would be doing maintenance off site, the only ground operations expected to increase with the addition of contract ADAIR aircraft would be the pre-flight run-up checks and trim tests. **Figure B-16** shows the location of all the static run-up locations at Kelly Field Annex. The proposed location for contract ADAIR aircraft parking is also noted on the figure. The locations at the ends of the runway 15RU and 33RU (named after the old runway names) are the locations for the arming and dearming of the F-16C aircraft. The trim pad is where trim test operations for ADAIR aircraft would be performed as well as the based F-16C aircraft. **Table B-9** details the number, type and duration of the on-field maintenance operations.

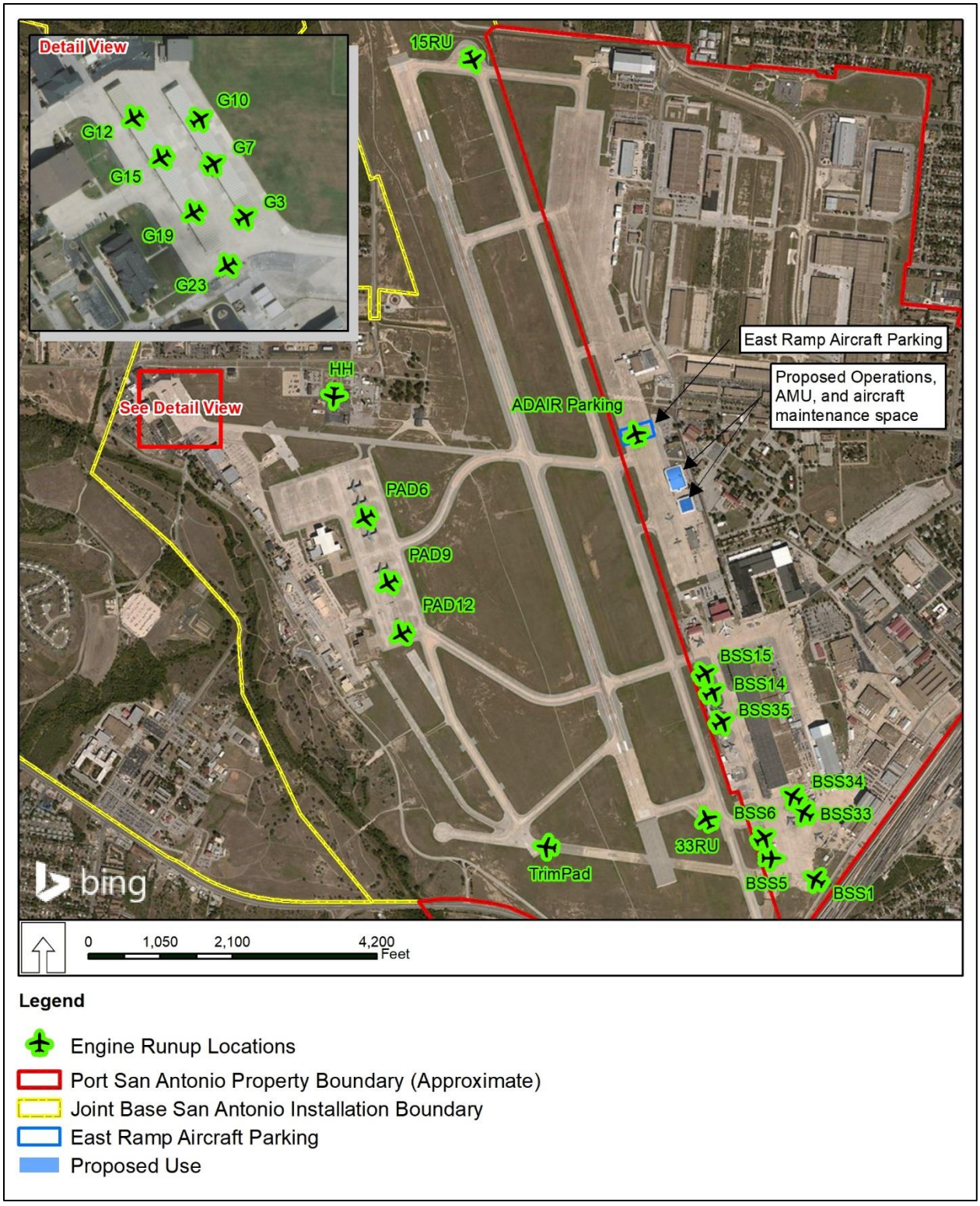


Figure B-16. Static Operations Locations.

Table B-9
Location, Type, and Duration of Ground/Maintenance Run-Up Operations at Kelly Field Annex

Aircraft Type	Engine Type	Run-up Type	Baseline Annual Events	ADAIR Events	Percent Day (0700-2200)	Percent Night (2200-0700)	Run-up Pad ID	Percent Pad used	Magnetic Heading (degrees)	Engine Power Setting	Duration Per Event (Minutes)	# of Engines Running Per Event
Hush House	F100-PW-100	Uninstalled F-16C using PW engine as substitute[1]	22	0	90%	10%	HH	100%	184	67%	30	1
										92%	30	
										A/B	25	
										80%	25	
F-16C	F110-GE-100	Arming	1/sortie	0	96%	4%	15RU/33RU	50/50%	156/336	67%-Idle	10	1
		Disarming	1/sortie	0	91%	9%	15RU/33RU	50/50%	156/336	67%-Idle	10	1
		Preflight	1/sortie	0	96%	4%	G 3,7,10,12,15,19,23	even	58/238	67%-Idle	15	1
		Engine Operations Checkout	3	0	100%	0%	Trim Pad	100%	278	74%	13	1
										103%-Mil	8 1/3	
										95%	2 1/3	
		Interface Checkout	10	0	100%	0%	Trim Pad	100%	278	74%	10	1
		Primary/Secondary Checkout	1	0	100%	0%	Trim Pad	100%	278	74%	10	1
		Intermediate Checkout	3	0	100%	0%	Trim Pad	100%	278	74%	11	1
										103%-Mil	3.5	
		Minimum Augmentor Checkout	13	0	100%	0%	Trim Pad	100%	278	74%	10	1
										103% - Mil	2	
										95%	1	
		Oile Consumption Checkout	3	0	100%	0%	Trim Pad	100%	278	74%	30	1
										103% - Mil	30	
										95%	25	
										80%	25	
		Oil Contamination Checkout	2	0	100%	0%	Trim Pad	100%	278	74%	10	1
										103% - Mil	10	
										95%	10	
		Isolation Checkout	2	0	100%	0%	Trim Pad	100%	278	74%	14	1
										103% - Mil	9	
										95%	2	
										95%	3	
										80%	7	
C-17	F117-PW-100	General Maintenance	52	0	95%	5%	BSS 33/34	50/50%	300	70%-Idle	30	2
										75%	15	
		Pre-Flight	1/sortie	0	100%	0%	BSS 33/34	50/50%	300	70%-Idle	5	2

Table B-9 (*continued*)
Location, Type, and Duration of Ground/Maintenance Run-Up Operations at Kelly Field Annex

Aircraft Type	Engine Type	Run-up Type	Baseline Annual Events	ADAIR Events	Percent Day (0700-2200)	Percent Night (2200-0700)	Run-up Pad ID	Percent Pad used	Magnetic Heading (degrees)	Engine Power Setting	Duration Per Event (Minutes)	# of Engines Running Per Event
C-5MX	CF6-80C2L1F	1 engine idle run	24	0	95%	5%	PAD 6,9,12	even	240	67%	30	1
		2 engine idle run	36	0	87%	13%	PAD 6,9,12	even	240	67%	30	2
		2 engine power run	108	0	87%	13%	PAD 6,9,12	even	240	67%	5	2
										80%	120	
		4 engine power run	108	0	93%	7%	PAD 6,9,12	even	240	67%	5	4
										80%	180	
		Preflight	1/sortie	0	80%	20%	PAD 6,9,12	even	240	67%	5	1
										67%	5	2
										67%	5	3
										67%	5	4
										67%-Trans. to Taxi.	20	4
C-32	JT8D-9A (C-9A used as surrogate)	General Maintenance	1	0	100%	0%	BSS33	100%	300	70%-Idle	45	2
										75%	45	
C-40	JT8D-9A (C-9A used as surrogate)	General Maintenance	1	0	100%	0%	BSS33	100%	300	70%-Idle	45	2
										75%	45	
C-32	JT8D-9A (C-9A used as surrogate)	Preflight	1	0	100%	0%	BSS35	100%	300	70%-Idle	45	2
C-40	JT8D-9A (C-9A used as surrogate)	Preflight	1	0	100%	0%	BSS35	100%	300	70%-Idle	45	2
B 747-800	F108-CF-100 (KC-135R used as surrogate)	Preflight	1/sortie	0	100%	0%	BSS1	100%	300	50%-Idle	15	4
		General Maintenance	12	0	100%	0%	BSS1	100%	300	100%	15	4
KC-135R/ B747-200	F108-CF-100 (KC-135R used as surrogate for B747-200)	Preflight - 2 for each aircraft	4	0	100%	0%	BSS 6,14,15	even	60	50% - Idle	15	4
		Engine Trim	2	0	100%	0%	BSS 5,6	50/50%	90/60	100% - Mil	15	2
			2	0	100%	0%	BSS 5,6	50/50%	90/60	100% - Mil	15	2
ADAIR CAT A		Pre/Post-Flight 2 Engine Run	0	1/sortie	100%	0%	ADAIR Parking	100%	342	Idle	20	1
		Trim	0	168	100%	0%	Trim Pad	100%	278	Idle	12	1
										Approach	27	
										Intermediate	9	
										Military	9	
										Afterburner	3	

(1) Beddown baseline provided maintenance records for 3888 and scaled to 3500.
(2) ADAIR trim testing based on ACAM model with 24 test/year/aircraft expecting 7 ADAIR aircraft.

This page intentionally left blank

APPENDIX C

AIR QUALITY

This page intentionally left blank

Appendix C-1

Air Conformity Applicability Analysis

This page intentionally left blank

C.1 AIR QUALITY

This appendix presents an overview of the Clean Air Act (CAA) and the state of Texas air quality regulations. It also presents calculations, including the assumptions used for the air quality analyses presented in the Air Quality sections of this Environmental Assessment.

C.1.1 Air Quality Program Overview

To protect public health and welfare, the US Environmental Protection Agency (USEPA) has developed numerical concentration-based standards, or National Ambient Air Quality Standards (NAAQS), for six "criteria" pollutants (based on health-related criteria) under the provisions of the CAA Amendments of 1970. There are two kinds of NAAQS: Primary and Secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (40 Code of Federal Regulations [CFR] 50).

The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the Federal program. The Texas Commission on Environmental Quality (TCEQ) oversees the state's air pollution control program under the authority of the Federal CAA and amendments, Federal regulations, and state laws. Texas has adopted the Federal NAAQS (TAC Title 30 §101.21). These standards are shown in **Table C-1**.

TCEQ, operates and maintains an ambient air monitoring network that follows the USEPA protocols and quality assurance/control procedures. Based on measured ambient air pollutant concentrations, the USEPA designates areas of the United States as having air quality better than (attainment) the NAAQS, worse than (nonattainment) the NAAQS, and unclassifiable. The areas that cannot be classified (on the basis of available information) as meeting or not meeting the NAAQS for a particular pollutant are "unclassifiable" and are treated as attainment until proven otherwise. Attainment areas can be further classified as "maintenance" areas, which are areas previously classified as nonattainment but where air pollutant concentrations have been successfully reduced to below the standard. Maintenance areas are under special maintenance plans and must operate under some of the nonattainment area plans to ensure compliance with the NAAQS.

Section 176(c) (1) of the CAA contains legislation that ensures Federal activities conform to relevant State Implementation Plans (SIP) and thus do not hamper local efforts to control air pollution. Conformity to a SIP is defined as conformity to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. As such a general conformity analysis is required for areas of nonattainment or maintenance where a Federal action is proposed.

The action can be shown to conform by demonstrating that the total direct and indirect emissions are below the *de minimis* levels (**Table C-2**), and/or showing that the proposed action emissions are within the State- or Tribe-approved budget of the facility as part of the SIP or Tribal Implementation Plan (USEPA 2010).

Direct emissions are those that occur as a direct result of the action. For example, emissions from new equipment that are a permanent component of the completed action (e.g. boilers, heaters, generators, paint booths, etc.) are considered direct emissions. Indirect emissions are those that occur at a later time or at a distance from the proposed action. For example, increased vehicular/commuter traffic because of the action is considered an indirect emission. Construction emissions must also be considered. For example, the emissions from vehicles and equipment used to clear and grade building sites, build new buildings, and construct new roads must be evaluated. These types of emissions are considered direct.

Table C-1
National Ambient Air Quality Standards

Pollutant	Standard Value[6]		Standard Type
Carbon Monoxide (CO)			
8-hour average	9 ppm	(10 mg/m^3)	Primary
1-hour average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual arithmetic mean	0.053 ppm	(100 µg/m^3)	Primary and Secondary
1-hour average[1]	0.100 ppm	(188 µg/m^3)	Primary
Ozone (O_3)			
8-hour average[2]	0.070 ppm	(137 µg/m^3)	Primary and Secondary
Lead (Pb)			
3-month average[3]		0.15 µg/m^3	Primary and Secondary
Particulate <10 Micrometers (PM_{10})			
24-hour average[4]		150 µg/m^3	Primary and Secondary
Particulate <2.5 Micrometers ($PM_{2.5}$)			
Annual arithmetic mean[4]		12 µg/m^3	Primary
Annual arithmetic mean[4]		15 µg/m^3	Secondary
24-hour average[4]		35 µg/m^3	Primary and Secondary
Sulfur Dioxide (SO_2)			
1-hour average[5]	0.075 ppm	(196 µg/m^3)	Primary
3-hour average[5]	0.5 ppm	(1,300 µg/m^3)	Secondary

Source: USEPA, 2016

Notes:
1 In February 2010, the USEPA established a new 1-hour standard for NO_2 at a level of 0.100 ppm, based on the 3-year average of the 98th percentile of the yearly distribution concentration, to supplement the then-existing annual standard.
2 In October 2015, the USEPA revised the level of the 8-hour standard to 0.070 ppm, based on the annual 4th highest daily maximum concentration, averaged over 3 years; the regulation became effective on 28 December 2015. The previous (2008) standard of 0.075 ppm remains in effect for some areas. A 1-hour standard no longer exists.
3 In November 2008, USEPA revised the primary lead standard to 0.15 µg/m^3. USEPA revised the averaging time to a rolling 3-month average.
4 In October 2006, USEPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 µg/m^3 and retained the level of the annual $PM_{2.5}$ standard at 15 µg/m^3. In 2012, USEPA split standards for primary and secondary annual $PM_{2.5}$. All are averaged over 3 years, with the 24-hour average determined at the 98th percentile for the 24-hour standard. USEPA retained the 24-hour primary standard and revoked the annual primary standard for PM_{10}.
5 In 2012, the USEPA retained a secondary 3-hour standard, which is not to be exceeded more than once per year. In June 2010, USEPA established a new 1-hour SO_2 standard at a level of 75 ppb, based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.
6 Parenthetical value is an approximately equivalent concentration for NO_2, O_3, and SO_2.

µg/m^3 = microgram(s) per cubic meter; mg/m^3 = milligram(s) per cubic meter; ppb = part(s) per billion; ppm = part(s) per million; USEPA = United States Environmental Protection Agency

Table C-2
General Conformity Rule *De Minimis* Emission Thresholds

Pollutant	Attainment Classification	Tons per year
Ozone (VOC and NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region (applicable to Kelly Field Annex)	***100***
Ozone (NO_x)	Marginal and moderate non-attainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
Carbon Monoxide, SO_2 and NO_2	All nonattainment and maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$ Direct emissions, SO_2, NO_x (unless determined not to be a significant precursor), VOC and ammonia (if determined to be significant precursors)	All nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

Source: USEPA, 2017

Each state is required to develop a SIP that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

In attainment areas, major new or modified stationary sources of air emissions on and in the area are subject to Prevention of Significant Deterioration (PSD) review to ensure that these sources are constructed without causing significant adverse deterioration of the clean air in the area. A major new source is defined as one that has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specific major source thresholds; that is, 100 or 250 tons/year based on the source's industrial category. These thresholds are applicable to stationary sources. A major modification is a physical change or change in the method of operation at an existing major source that causes a significant "net emissions increase" at that source of any regulated pollutant. **Table C-3** provides a tabular listing of the PSD significant emissions rate (SER) thresholds for selected criteria pollutants (USEPA, 1990).

Table C-3
Criteria Pollutant Significant Emissions Rate Increases Under Prevention of Significant Deterioration Regulations

Pollutant	Significant Emission Rate (ton/year)
PM_{10}	15
$PM_{2.5}$	10
Total Suspended Particulate (TSP)	25
SO_2	40
NO_x	40
Ozone (VOCs)	40
CO	100

Source: Title 40 CFR Part 52 Subpart A, §52.21

The goals of the PSD program are to (1) ensure economic growth while preserving existing air quality; (2) protect public health and welfare from adverse effects that might occur even at pollutant levels better than the NAAQS; and (3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas. Sources subject to PSD review are required by the CAA to obtain a permit before commencing construction. The permit process requires an extensive review of all other major sources within a 50-mile radius and all Class I areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using Best Available Control Technology. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase identified in **Table C-4**. National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development. There are no Class I areas near Kelly Field Annex.

Table C-4
Federal Allowable Pollutant Concentration Increases Under Prevention of Significant Deterioration Regulations

Pollutant	Averaging Time	Maximum Allowable Concentration ($\mu g/m^3$)		
		Class I	Class II	Class III
PM_{10}	Annual	4	17	34
	24-hour	8	30	60
SO_2	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
NO_2	Annual	2.5	25	50

Source: Title 40 CFR Part 52 Subpart A, §52.21

The Air Quality Monitoring Program monitors ambient air throughout the state. The purpose is to monitor, assess and provide information on statewide ambient air quality conditions and trends as specified by the state and federal CAA. The Air Quality Monitoring Program works in conjunction with local air pollution agencies and some industries, measuring air quality throughout the states.

The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the

standards. Also included are areas where the ambient standards are being met, but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality, exceedances of air quality standards, and pollutant trends.

C.1.2 Assumptions

The following are assumptions were used in the air quality analysis for the proposed and alternative actions:

1. No construction (or negligible construction) would be associated with any of the proposed alternatives. This includes no demolition, earth moving, hauling, or paving. Some minor interior building fabrication would be possible but affected square footage is too small to result in outdoor air quality impacts. This may include upgrade to fire suppression/life support systems.
2. No installation of new boilers. No generators will be used for Alternatives 2 and 3.
3. No new storage tanks would be installed - Additional Jet A fuel needed by contractor aircraft is calculated for analysis calculated based on engine type, number of sorties, and engine fuel consumption rate.
4. Air force personnel would deliver fuel to the contractor at the airfield using tank trucks. Gas and diesel/Jet A fuel for the Contractor's Aerospace Ground Equipment (AGE) and flight line special purpose vehicles would be obtained by contract adversary air (ADAIR) personnel from the base military service station.
5. Chaff and flares to be used by contractor will be stored using current facilities (additional/new ammunition storage facilities not needed).
6. No new Hush House/Engine Test Cell facilities would be installed, and existing Hush House/Engine Test Cell facilities would not be used for ADAIR contractor aircraft.
7. No new paint booths would be installed, and existing paint booths would not be used for ADAIR contractor aircraft.
8. Contractor may bring their own parts cleaner (or share already installed unit unknown at this time) - for either case it is assumed contractor use would be minimal (no more than 0.5 gal/mo solvent used/lost).
9. Maintenance for contractor aircraft would be limited to minor repairs and minor routine maintenance /inspections (significant repairs, schedule/phased maintenance and inspections to be conducted off-site).
10. While ADAIR targeted performance is estimated to start in February 2020 with a 10-year contract, the emissions were estimated for each year of the Proposed Action beginning in July 2019 and ending in June 2029. For air quality modeling purposes, these are representative years; the modeling generates air emissions estimates for the life of a representative 10-year contract. A full year is a reference year and partial years (start and end year) may be determined by dividing by the number of months estimated for that year.
11. Contractor aircraft takeoff and landing cycles - use/assume Air Conformity Applicability Model (ACAM) default "times in mode" to be conservative.
12. Assume once an aircraft is out of the landing and take-off (LTO) cycle the time spent traveling to/from the Military Operations Areas (MOAs) (10 to 20 minutes) would be at an altitude above 3,000 feet.
13. Assume mixing height is 3,000 feet (this matches USEPA and Air Force Guidance).
14. Air Force training sorties would not increase or decrease as result of this action. Roles may change (i.e., the Air Force no longer need to play the adversary, but this would not change in any substantial way the number of Air Force sorties flown). Thus, the change (increase) in emissions for Aircraft Flight Operations (AOPS) would be strictly due to the addition of the contractor ADAIR aircraft and associated ground and maintenance activities.
15. Assume the number of transient aircraft utilizing the airfield would not increase or decrease as a direct result of Contractor ADAIR.

16. Air Force use of engine test cells/hush house would not change as a result of the proposed action. No changes to Air Force trim tests also assumed.
17. For contactor AGE and auxiliary power units (APUs), until the contractor is selected what they would bring/use in terms of AGE and APUs in unknown thus ACAM defaults will be used based on the surrogate aircraft and engine type.
18. Assume contractor aircraft would engage in LTO cycles, and touch and go (TGO) or low approach activities only in the vicinity of the airfield.
19. Assume 5 percent of on-airfield daytime sorties (1,080) would include multiple patterns for contractor proficiency.
20. It is unknown what contractor requirements would be for trim tests, thus ACAM defaults will be assumed based on surrogate aircraft and engine type.
21. Assume all new ADAIR contractor personnel (pilots and maintenance staff) would live off-base and commute to the base 5 days per week. ACAM defaults will be used for commute distances.
22. ADAIR training sorties would utilize chaff and flares (as described in Chaff/Flare Allocations V5). Only RR-188 chaff and M206 flares would be considered in the analysis. Chaff and flares would be used in all MOAs except for Brady (Low and High).
23. Assume air quality impacts from chaff releases under actual flight conditions would be low and would have negligible impact on the PM_{10} and $PM_{2.5}$ NAAQS (1997 Report: *Environmental Effects of Self-protection Chaff and Flares*).
24. Only the use of flares and impulse cartridges (if applicable) used at or below 3,000 feet will be included in the air quality analysis. It is assumed that flares used above 3,000 feet would disperse and not affect air quality in the lowest 3,000 feet AGL. While, contract ADAIR aircraft would employ M206 flares or similar during 100 percent of their training sortie operations, without altitude restrictions, in the following MOAs: Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, Laughlin 3 High, and Kingsville 3; flares would not be used in the Brady Low and High MOAs (no flares would be used at altitudes less than 3,000 feet). As a result, flare emissions will not be included in the air quality analysis.
25. For the high air emission scenario, the surrogate for the MIG-21 is the F16 C/D with engine model F110-GE-100.
26. For the medium emission scenario, the surrogate for the A-4N is the A-4M with engine model J52-P408.
27. For the low emission scenario, the surrogate for the L-59 & L-159 is the A101A with engine model TF34-GE-100.
28. All ADAIR related training at Kelly Field Annex would occur in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, and Laughlin 3 High; Kingsville 3; and Brady Low and High MOAs as designated in the description of the Proposed Action in this Environmental Assessment and as summarized in this appendix.
29. Contractor training/mission time in the MOAs would be approximately 45 to 60 minutes. Currently, only Brady MOA (Brady Low) would have a floor below 3,000 feet AGL (500 feet AGL).
30. Estimated amount of time each ADAIR contractor aircraft would spend within the Brady MOA at or below 3,000 feet AGL is proportioned based on percent time spent between 500 to 6,000 feet. Assuming an average mission time of 52.2 minutes, the time spent at or below 3,000 feet AGL would be 11.9 minutes (see **Table C-5**).
31. ACAM does not have separate inputs for time spent within a MOA. To represent the time spent within a MOA, the expected flight time at or below 3,000 feet (11.9 minutes) was assigned to Climbout/Intermmediate power mode within the ACAM LTO input fields. No time was assigned to any other power modes, but default ACAM output also lists Trim Tests and TGOs; however, all inputs for these fields were set to zero (see **Table C-6**).
32. Assume time spent below 3,000 feet AGL would be the same for all sorties.
33. The number of sorties in the Brady MOA would be 5 percent of the total sorties (0.05 * 1200 = 60 sorties) (see **Table C-5**).
34. No changes baseline Air Force Aircraft AOPS (sorties) due to Contract ADAIR and no changes to transient and civilian AOPS due to Contract ADAIR.
35. Emissions for Alternatives 2 and 3 would be identical (AOPS identical and no construction).
36. Alternative 1 would include the possibility of the installation of a new emergency generator (ACAM defaults used for size and average annual operating hours).

37. Installation Category for Air Emission = A.
38. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 feet AGL) and coinciding with the spatial distribution of the region of influence that is considered. Pollutants that are released above the mixing height typically would not disperse downward and thus would have little or no effect on ground level concentrations of pollutants. The mixing height is the altitude at which the lower atmosphere undergoes mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the volume of air within which pollutants can disperse. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 feet AGL is an acceptable default value [40 CFR 93.153(c)(2)]. Although the proposed ADAIR training is projected to occur within multiple MOAs coinciding with five separate Air Quality Control Regions (AQCRs), only the Brady Low and High MOAs, coinciding with the Midland-Odessa-San Angelo AQCR and the Austin-Waco AQCR is a concern because it is the only airspace where ADAIR sortie altitudes are proposed to extend below 3,000 feet AGL.
39. **Tables C-5** and **C-6** below show the data and assumptions used as input to ACAM for flight operations.

Table C-5
Airspace Assumptions and Air Conformity Applicability Model Data Inputs

MOA	Percent of Total Sorties	No. of Sorties in MOAs[1]	Minimum Mission Altitude	Total Mission Time (minutes) ≤3,000 ft AGL	Power Mode[5]
Brady (Low & High)[2]	5	60	500 ft AGL[3]	11.9[4]	Intermediate/Climbout
Crystal & Laughlin	85	1,020	6,000 ft AGL	0	N/A
Kingsville 3	10	120	8,000 ft AGL	0	N/A

Notes:
[1] Based on 1,200 Total Sorties in MOAs (Source: CAF ADAIR EIS Calculator - NEPA 6)
[2] Assume a portion of all sorties to occur in Brady will occur at or below 3,000 ft
[3] Estimated 50 percent of time spent between 500 to 6,000 ft AGL
[4] Based on 52.5 minutes per sortie (per the pre-final DOPAA, 45 to 60 minutes per sortie) and proportioned based on percent of time spent between 500 to 6,000 ft
Minutes @ 500 to 6,000 ft = 52.5 minutes * 50 percent (percent time in altitude range) = 26.25 minutes
Minutes @ 500 to 3,000 ft = 26.25 minutes - (26.25 minutes * 3,000 ft/5,500 ft) = 11.9 minutes
[5] ACAM does not have separate inputs for time spent within a MOA. To represent the time spent within a MOA, the expected flight time at or below 3,000 ft (11.9 minutes) was assigned to Climbout/Intermediate power mode within the ACAM LTO input fields. No time was assigned to any other power modes.

ACAM = Air Conformity Applicability Model; ADAIR = adversary air; AGL = above ground level; CAF = Combat Air Forces; DOPAA = Description of Proposed Action and Alternatives; EIS = Environmental Impact Statement, ft = feet; LTO = landing and take-off; N/A = not applicable; NEPA = National Environmental Policy Act

Table C-6
Times in Mode[1] (minutes) for Aircraft Operations

Type of Operation	Number of Sorties	Taxi/Idle (out)	Take-off (Military and/or Afterburn	Climb Out	Approach	Taxi/Idle(in)
LTO	1200	18.5	0.4	0.8	3.5	11.3
TGO[2]	162	-	-	0.8	3.5	-

Notes:
[A] Given time in mode applicable to all emission scenarios (high, medium, and low)
[B] 5 percent of on-airfield daytime sorties (1,080) are expected to include multiple patterns for contractor proficiency. Each of those 5 percent sorties is assumed to include three TGO/low approaches.

LTO = landing and take-off; TGO = touch and go

C.1.3 Regulatory Comparisons

The CAA Section 176(c), General Conformity, requires Federal agencies to demonstrate that their proposed activities would conform to the applicable SIP for attainment of the NAAQS. General conformity applies only to nonattainment and maintenance areas. If the emissions from a Federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required of that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases. The Council on Environmental Quality (CEQ) defines significance in terms of context and intensity in 40 CFR 1508.27. This requires that the significance of the action be analyzed with respect to the setting of the proposed action and based relative to the severity of the impact. The CEQ NEPA regulations (40 CFR 1508.27[b]) provide 10 key factors to consider in determining an impact's intensity.

Emissions from the proposed action in the vicinity of the Kelly Field Annex (Bexar County) were assessed against conformity standard *de minimis* thresholds of 100 tons per year for NO_x and VOC as stipulated by 40 CFR 93. The remaining criteria pollutants are compared to respective county emissions, which are in attainment. Estimates of emissions are summarized in **Chapter 4**. ACAM summary reports for each emission scenario for the Kelly Field Annex and Brady Low and High MOAs are provided as **Appendix C-2** of this Air Quality summary report.

C.2 REFERENCES

USEPA. 1990. Office of Air Quality Planning and Standards. *Draft New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Permitting.* October.

USEPA. 2010. *40 CFR Parts 51 and 93, Revisions to the General Conformity Regulations*. 75 FR 14283, EPA-HQ-OAR-2006-0669; FRL-9131-7. 24 March.

USEPA. 2016. *NAAQS Table*. <https://www.epa.gov/criteria-air-pollutants/naaqs-table>. 20 December.

USEPA. 2017. General Conformity: *De Minimis* Tables. <https://www.epa.gov/general-conformity/de-minimis-tables>. 04 August.

Appendix C-2

Emission Factors and Calculation Algorithms
(Source: ACAM Output - Detail Report)

This page intentionally left blank

Aircraft Operations

Engine Emission Factor(s)

Aircraft & Engine Emissions Factors (lb/1000lb fuel) - F-16, Engine Model F110-GE-100, 1 Engine

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1111.00	0.22	1.06	3.77	24.11	2.60	1.12	3234
Approach	5080.00	0.03	1.06	9.78	5.77	1.37	0.91	3234
Intermediate	7332.00	0.05	1.06	16.92	3.47	0.58	0.41	3234
Military	11358.00	0.04	1.06	29.00	3.38	0.14	0.00	3234
After Burn	18088.00	1.21	1.06	14.26	67.41	3.35	2.98	3234

Aircraft & Engine Emissions Factors (lb/1000lb fuel) - A-4M, Engine Model J52-P-408, 1 Engine

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1466.21	3.62	1.06	2.79	50.10	0.18	0.16	3234
Approach	3324.50	0.29	1.06	7.25	16.07	0.18	0.16	3234
Intermediate	6502.10	0.03	1.06	7.53	7.70	0.13	0.12	3234
Military	6482.85	0.03	1.06	7.53	7.70	0.13	0.12	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

Aircraft & Engine Emissions Factors (lb/1000lb fuel) – OA-10A, Engine Model TF34-GE-100, 2 Engines

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	390.00	39.45	1.06	2.10	106.70	8.13	3.60	3234
Approach	920.00	2.19	1.06	5.70	16.30	6.21	2.12	3234
Intermediate	460.00	23.35	1.06	2.60	78.00	8.93	6.95	3234
Military	2710.00	0.12	1.06	10.70	2.20	2.66	1.68	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

Flight Operations

Number of Aircraft:	7
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft:	1200
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft:	162
Number of Annual Trim Test(s) per Aircraft:	24

Flight Operations TIMs (Time in Mode)

Taxi/Idle Out [Idle] (mins):	18.5 (default)
Takeoff [Military and/or After Burn] (mins):	0.4 (default)
Climb Out [Intermediate] (mins):	0.8 (default)
Approach [Approach] (mins):	3.5 (default)
Taxi/Idle In [Idle] (mins):	11.3 (default)

Trim Test TIM (Time in Mode)

Idle (mins):	12 (default)
Approach (mins):	27 (default)
Intermediate (mins):	9 (default)
Military (mins):	9 (default)
AfterBurn (mins):	3 (default)

Flight Operations Formula(s)

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

Aircraft Emissions for LTOs per Year

$$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

Aircraft Emissions per Mode for TGOs per Year

$$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

Aircraft Emissions for TGOs per Year

$$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

Aircraft Emissions per Mode for Trim per Year

$$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

Aircraft Emissions for Trim per Year

$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

Aerospace Ground Equipment (AGE)

Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
MC-1A - 18.4hp	1.1	0.267	0.008	0.419	0.267	0.071	0.068	24.8
MJ-1B	0.0	3.040	0.219	4.780	3.040	0.800	0.776	141.2
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147.0
H1	0.4	0.100	0.011	0.160	0.180	0.006	0.006	8.9
MJ-2A	0.0	0.190	0.238	3.850	2.460	0.083	0.076	172.0
NF-2	0.0	0.010	0.043	0.110	0.080	0.010	0.010	22.1
A/M32A-60A	0.0	0.270	0.306	1.820	5.480	0.211	0.205	221.1

Aerospace Ground Equipment (AGE) (default)

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
1	0.33	No	Air Compressor	MC-1A - 18.4hp
1	1	No	Bomb Lift	MJ-1B
1	0.33	No	Generator Set	A/M32A-86D
1	0.5	No	Heater	H1
1	0.5	No	Hydraulic Test Stand	MJ-2/TTU-228 - 130hp
1	8	No	Light Cart	NF-2
1	0.33	No	Start Cart	A/M32A-60A

Aerospace Ground Equipment (AGE) Formula(s)

Aerospace Ground Equipment (AGE) Emissions per Year

$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

Auxiliary Power Unit (APU)

Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
T-62T-40-8	272.6	0.493	0.289	1.216	3.759	0.131	0.037	910.8

Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer
1	1	No	T-62T-40-8	

Auxiliary Power Unit (APU) Formula(s)

Auxiliary Power Unit (APU) Emissions per Year

$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

Personnel on Road Vehicles

On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.292	000.002	000.232	003.373	000.006	000.006		000.024	00335.434
LDGT	000.379	000.003	000.412	004.908	000.008	000.007		000.025	00433.594
HDGV	000.810	000.005	001.116	016.538	000.019	000.017		000.045	00785.640
LDDV	000.100	000.003	000.141	002.747	000.004	000.004		000.008	00328.227
LDDT	000.267	000.004	000.433	005.052	000.007	000.007		000.008	00471.807
HDDV	000.480	000.013	004.936	001.769	000.190	000.175		000.028	01524.947
MC	002.743	000.003	000.699	012.761	000.026	000.023		000.054	00395.722

On Road Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	37.55	60.32	0	0.03	0.2	0	1.9
GOVs	54.49	37.73	4.67	0	0	3.11	0

Average Personnel Round Trip Commute (mile): 20 (default)

Personnel Work Schedule

Active Duty Personnel:	5 Days Per Week (default)
Civilian Personnel:	5 Days Per Week (default)
Support Contractor Personnel:	5 Days Per Week (default)
Air National Guard (ANG) Personnel:	4 Days Per Week (default)
Reserve Personnel:	4 Days Per Month (default)

Personnel Formula(s)

Personnel Vehicle Miles Travel for Work Days per Year

$VMT_P = NP * WD * AC$

VMT_P: Personnel Vehicle Miles Travel (miles/year)
NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

Total Vehicle Miles Travel per Year

$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_{C}: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

Vehicle Emissions per Year

$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Parts Cleaner/Degreaser

Solvent used:	Mineral Spirits CAS#64475-85-0 (default)
Specific gravity of solvent:	0.78 (default)
Solvent VOC content (%):	100 (default)
Efficiency of control device (%):	0 (default)

Parts Cleaner/Degreaser Formula(s)

Degreaser Emissions per Year

$DE_{VOC} = (VOC / 100) * NS * SG * 8.35 * (1 - (CD / 100)) / 2000$

DE_{VOC}: Degreaser VOC Emissions (TONs per Year)
VOC: Solvent VOC content (%)
(VOC / 100): Conversion Factor percent to decimal
NS: Net solvent usage (total less recycle) (gallons/year)
SG: Specific gravity of solvent
8.35: Conversion Factor the density of water
CD: Efficiency of control device (%)
(1 - (CD / 100)): Conversion Factor percent to decimal (Not effected by control device)
2000: Conversion Factor pounds to tons

Storage Tanks

Chemical Properties

Chemical Name:	Jet kerosene (JP-5, JP-8 or Jet-A)
Chemical Category:	Petroleum Distillates
Chemical Density:	7
Vapor Molecular Weight (lb/lb-mole):	130
Stock Vapor Density (lb/ft^3):	0.000170775135930213
Vapor Pressure:	0.00725
Vapor Space Expansion Factor (dimensionless):	0.068

Tank Characteristics

Type of Tank:	Vertical Tank
Tank Height (ft):	50
Tank Diameter (ft):	63
Annual Net Throughput (gallon/year):	187348

Tank Formula(s)

Vapor Space Volume

$VSV = (PI / 4) * D^2 * H / 2$

VSV: Vapor Space Volume (ft^3)
PI: PI Math Constant
D^2: Tank Diameter (ft)
H: Tank Height (ft)
2: Conversion Factor (Vapor Space Volume is assumed to be one-half of the tank volume)

Vented Vapor Saturation Factor

$VVSF = 1 / (1 + (0.053 * VP * H / 2))$

VVSF: Vented Vapor Saturation Factor (dimensionless)
0.053: Constant
VP: Vapor Pressure (psia)
H: Tank Height (ft)

Standing Storage Loss per Year

$SSL_{VOC} = 365 * VSV * SVD * VSEF * VVSF / 2000$

SSL_{VOC}: Standing Storage Loss Emissions (TONs)
365: Number of Daily Events in a Year (Constant)
VSV: Vapor Space Volume (ft^3)
SVD: Stock Vapor Density (lb/ft^3)
VSEF: Vapor Space Expansion Factor (dimensionless)
VVSF: Vented Vapor Saturation Factor (dimensionless)
2000: Conversion Factor pounds to tons

Number of Turnovers per Year

$NT = (7.48 * ANT) / ((PI / 4.0) * D * H)$

NT: Number of Turnovers per Year
7.48: Constant
ANT: Annual Net Throughput
PI: PI Math Constant
D^2: Tank Diameter (ft)
H: Tank Height (ft)

Working Loss Turnover (Saturation) Factor per Year

$WLSF = (18 + NT) / (6 * NT)$

WLSF: Working Loss Turnover (Saturation) Factor per Year
18: Constant
NT: Number of Turnovers per Year
6: Constant

Working Loss per Year

$WL_{VOC} = 0.0010 * VMW * VP * ANT * WLSF / 2000$

0.0010: Constant
VMW: Vapor Molecular Weight (lb/lb-mole)
VP: Vapor Pressure (psia)
ANT: Annual Net Throughput

WLSF: Working Loss Turnover (Saturation) Factor
2000: Conversion Factor pounds to tons

Emergency Generator

Emergency Generators Emission Factor (lb/hp-hr)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
0.00279	0.00235	0.0115	0.00768	0.00251	0.00251			1.33

Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 1
Emergency Generator's Horsepower: 135
Average Operating Hours Per Year (hours): 30

Emergency Generator Formula(s)

Emergency Generator Emissions per Year

AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)

This page intentionally left blank

APPENDIX D

LISTED SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

This page intentionally left blank

THREATENED AND ENDANGERED SPECIES/CRITICAL HABITAT

A list of species that could potentially be found in the action area was obtained from the United States Fish and Wildlife Service (USFWS) Southwest Region website and from Texas Parks and Wildlife Department (TPWD) and is provided in **Table D-1**. Additionally, several endemic listed species are present in the habitat related to Comal and San Marcos Springs in Comal and Hays Counties. These habitats are directly related to the water use in the Edwards Aquifer and its potential impact on the Comal and San Marcos Springs and related endemic species. Because JBSA obtains water from the Edwards Aquifer and has a Biological Opinion issued for its water use, the listed species are covered in this section; however, no known federally listed threatened or endangered species have been documented at JBSA-Lackland, including Kelly Field Annex (JBSA, 2014). Further, the 45 contracted maintainers and 9 contracted pilots would not cause a substantial increase in use in potable water in support of the contract ADAIR action and would have no effect on the Edwards Aquifer; therefore, the endemic listed species related to the Comal and San Marcos Springs are not discussed further.

There is potentially suitable habitat for five state listed species at JBSA-Lackland and Kelly Field Annex; these are the state threatened white-faced ibis (*Plegadis chihi*), Texas horned lizard (*Phrynosoma cornutum*), Texas indigo snake (*Drymarchon melanurus erebennus*), Texas tortoise (*Gopherus berlandieri*), and the Timber rattlesnake (*Crotalus horridus*); however, as there would be no ground activities at JBSA-Lackland and Kelly Field Annex, there would be no adverse effects on the four sensitive reptile species; therefore, they will not be discussed further.

Because there would be no ground activities in the Crystal, Crystal North, Laughlin 2 and 3, Kingsville 3, and Brady Low/High MOAs, and activities would be limited to aircraft overflights in the airspace where noise and visual cues could cause behavioral changes in birds and mammals, there would be no impacts on listed plants, aquatic species (i.e., fish), reptiles, amphibians, invertebrates, or crustaceans; therefore, of the listed species potentially occurring in the project area, 6 federally and 13 state listed birds (for a total of 14 unique species); four federally listed mammals and six state listed mammals (for a total of six unique species) could be impacted by the proposed action in the airspace. The federally and state endangered whooping crane (*Grus americana*), federally threatened rufa red knot (*Calidris canutus rufa*), and federally and state threatened wood stork (*Mycteria americana*), however, are costal species and would be unlikely to occur anywhere within the Crystal, Crystal North, Laughlin 2 and 3, Kingsville 3, and Brady Low/High MOAs except at limited times during migration. Further, although historically present within the area, there are no known recent occurrences of the federally and state endangered red wolf (*Canis rufus*) or the federally and state endangered gray wolf (*Canis lupus*) in the area or nearby environs, with the nearest known populations of the gray wolf in the Gila Mountains of New Mexico and Arizona and in the northern United States and Canada.

No designated critical habitat for any listed species occurs in the action area.

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
Birds			
Whooping Crane (*Grus americana*)	Endangered	Endangered	Low
Piping Plover (*Charadrius melodus*)	Threatened	Threatened	Low
Black-Capped Vireo (*Vireo atricapilla*)	Recovery	Endangered	Yes
Golden-Cheeked Warbler (*Setophaga chrysoparia*)	Endangered	Endangered	Yes
Rufa Red Knot (*Calidris canutus rufa*)	Threatened	-	Low

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
White-Faced Ibis (*Plegadis chihi*)	-	Threatened	Yes
Wood Stork (*Mycteria americana*)	-	Threatened	Low
Zone-Tailed Hawk (*Buteo albonotatus*)	-	Threatened	Yes
Peregrine Falcon (*Falco peregrinus*)	-	Threatened	Yes
White-Tailed Hawk (*Buteo albicaudatus*)	-	Threatened	Low
Common Black-Hawk (*Buteogallus anthracinus*)	-	Threatened	Low
Texas Botteri's Sparrow (*Peucaea botterii texana*)	-	Threatened	Yes
Bald Eagle (*Haliaeetus leucocephalus*)	Recovery	Threatened	Yes
Interior Least Tern (*Sterna antillarum athalassos*)*	Endangered	Endangered	Yes
Mammals			
Red Wolf (*Canis rufus*)*	Endangered	Endangered	None
Grey Wolf (*Canis lupus*)*	Endangered	Endangered	None
Black Bear (*Ursus americanus*)	-	Threatened	Low
Ocelot (*Leopardus pardalis*)	Endangered	Endangered	Yes
White-Nosed Coati (*Nasua narica*)	-	Threatened	Yes
Gulf Coast Jaguarundi (*Herpailurus yagouaroundi cacomitli*)	Endangered	Endangered	None[2]
Reptiles			
Texas Tortoise (*Gopherus berlandieri*)	-	Threatened	Yes
Texas Horned Lizard (*Phrynosoma cornutum*)	-	Threatened	Yes
Texas Indigo Snake (*Drymarchon melanurus erebennus*)	-	Threatened	Yes
Texas Scarlet Snake (*Cemophora coccinea lineri*)			Yes
Reticulate Collared Lizard (*Crotaphytus reticulatus*)	-	Threatened	Yes
Concho Water Snake (*Nerodia paucimaculata*)	Recovery	-	Low
Timber Rattlesnake (*Crotalus horridus*)	-	Threatened	Yes
Amphibians			
Cascade Caverns Salamander (*Eurycea latitans* complex)	-	Threatened	None
South Texas Siren (*Siren sp.*)	-	Threatened	None
Black-Spotted Newt (*Notophthalmus meridionalis*)	-	Threatened	Yes

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
Sheep Frog (*Hypopachus variolosus*)	-	Threatened	Yes
Comal Blind Salamander (*Eurycea tridentifera*)	-	Threatened	None
Mollusks			
Texas Pimpleback (*Quadrula petrina*)	Candidate	-	Yes
Texas Fatmucket (*Lampsilis bracteata*)	Candidate	Threatened	Yes
Texas Hornshell (*Popenaias popeii*)	Candidate	Threatened	Yes
Mexican Fawnsfoot Mussel (*Truncilla cognata*)	-	Threatened	Yes
Salina Mucket (*Potamilus metnecktayi*)	-	Threatened	Yes
False Spike Mussel (*Fusconaia mitchelli*)	-	Threatened	Yes
Texas Fawnsfoot (*Truncilla macrodon*)	Candidate	Threatened	Yes
Smooth Pimpleback (*Cyclonaias houstonensis*)	Candidate	Threatened	Yes
Golden Orb (*Quadrula aurea*)	Candidate	Threatened	Yes
Crustaceans			
Peck's Cave Amphipod (*Stygobromus* (=*Stygonectes*) *pecki*)	Endangered	-	None
Arachnids			
Cokendolpher Cave Harvestman (*Texella cokendolpheri*)	Endangered	-	Low
Government Canyon Bat Cave Spider (*Neoleptoneta microps*)	Endangered	-	Low
Madla's Cave Meshweaver (*Cicurina madla*)	Endangered	-	Low
Robber Baron Cave Meshweaver (*Cicurina baronia*)	Endangered	-	Low
Braken Bat Cave Meshweaver (*Cicurina venii*)	Endangered	-	Low
Insects			
Comal Springs Riffle Beetle (*Heterelmis comalensis*)	Endangered	-	None
Comal Springs Dryopid Beetle (*Stygoparnus comalensis*)	Endangered	-	None
[no common name] Beetle (*Rhadine infernalis*)	Endangered	-	None
Helotes Mold Beetle (*Batrisodes venyivi*)	Endangered	-	Low
[no common name] Beetle (*Rhadine exilis*)	Endangered	-	None
Fish			
Fountain Darter (*Etheostoma fonticola*)	Endangered	Endangered	None
Widemouth Blindcat (*Satan eurystomus*)	-	Threatened	Yes
Rio Grande Silvery Minnow (*Hybognathus amarus*)	Endangered*	Endangered	Low

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
Devils River Minnow (*Dionda diaboli*)	Threatened	Threatened	Low
Proserpine Shiner (*Cyprinella proserpina*)	-	Threatened	Yes
Blue Sucker (*Cycleptus elongatus*)	-	Threatened	Yes
Rio Grande Darter (*Etheostoma grahami*)	-	Threatened	Yes
Toothless Blindcat (*Trogloglanis pattersoni*)	-	Threatened	None
Plants			
Bracted Twistflower (*Streptanthus bracteatus*)	Candidate	-	Yes
Tobusch Fishhook Cactus (*Sclerocactus brevihamatus* ssp. *tobuschii*)	Threatened	Endangered	Yes
Texas Snowbells (*Styrax texanus*)	Endangered	Endangered	Yes
Johnston's Frankenia (*Frankenia johnstonii*)	Recovery	-	Yes
Ashy Dogweed (*Thymophylla tephroleuca*)	Endangered	Endangered	Yes
South Texas Ambrosia (*Ambrosia cheiranthifolia*)	Endangered	Endangered	Yes
Black lace Cactus (*Echinocereus reichenbachii* var. *albertii*)	Endangered	Endangered	Yes
Walker's Manioc (*Manihot walkerae*)	Endangered	Endangered	Yes
Texas Wild-Rice (*Zizania texana*)	Endangered	Endangered	None

Source: [1]USFWS, 2018; [2]TPWDc, 2018

Notes:

* Listed by TPWD as potentially occurring in the action area but not listed by USFWS as potentially occurring in the action area.
[1] Action Area includes Kelly Field Annex and the Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, Brady Low, and Brady High Military Operations Areas
[2] While believed to be extirpated from Texas, this species range is still listed in counties within the proposed action area.

TPWD = Texas Parks and Wildlife Department; USFWS = United States Fish and Wildlife Service

REFERENCE

JBSA. 2014. *Integrated Natural Resources Management Plan Update, Joint Base San Antonio*. Prepared for JBSA and Air Education and Training Command by Weston Solutions, Austin, Texas. September.